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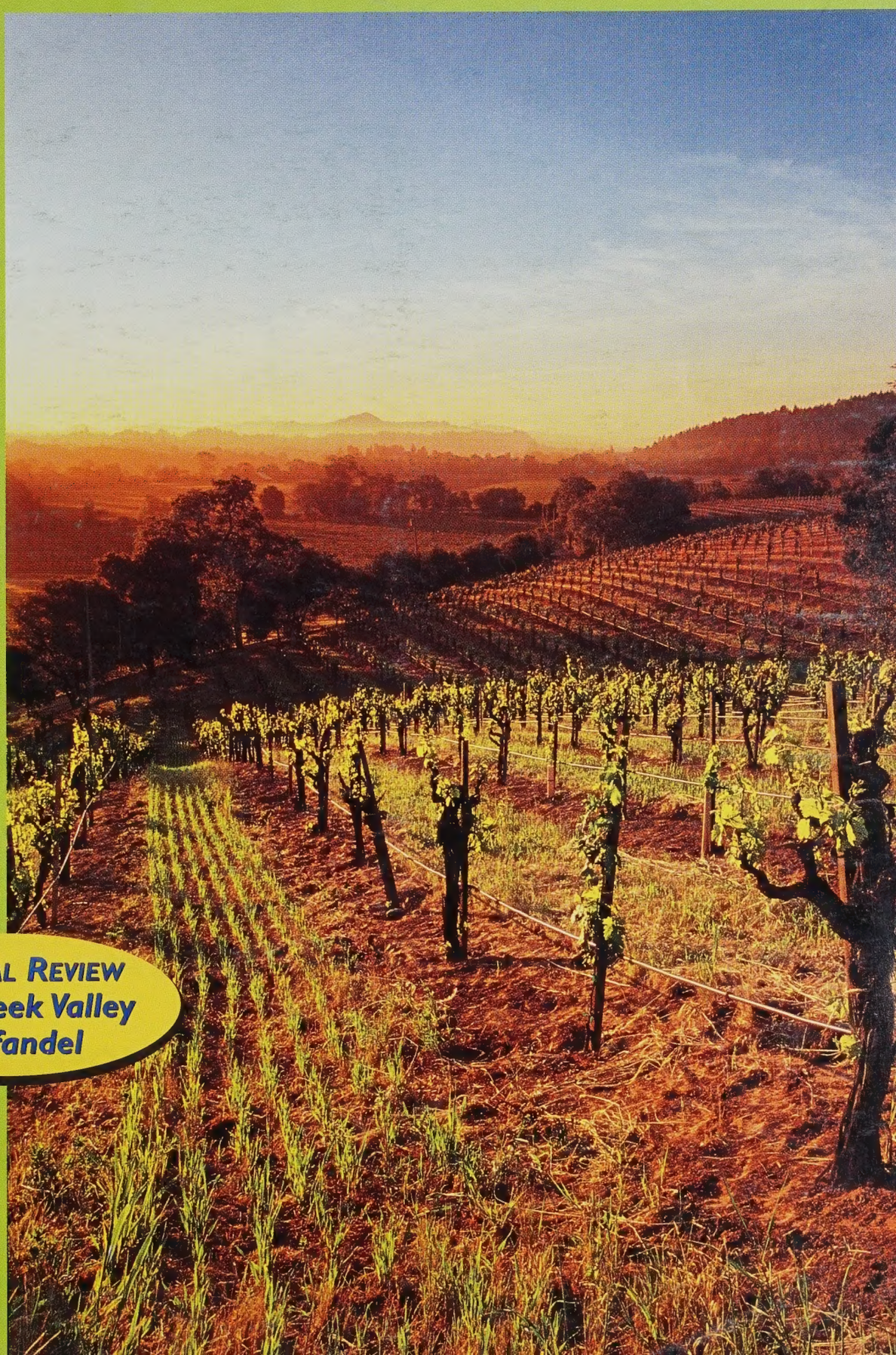

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Cover photo: Dry Creek Valley from Quivira Vineyards, Healdsburg, CA. Photo by Fred Lyon.

"To stimulate continuing improvement in the wine industry."

New *challenges* await growers

**BY James F. Verhey,
President, UCC Vineyards,
CEO, Premiere Viticultural Services,
Napa, CA**

For those of us in the California wine industry who have wondered whether "Two Buck Chuck" (Charles Shaw's groundbreaking line of $1.99 wines) is for real and whether it has changed the consumer's focus from "Quality" to "Price/Value," the answer is a resounding "Yes!"

In a Wine Industry Financial Symposium (September 2003) survey of wholesale distributors (organized by David Freed of UCC Vineyards and conducted by the University of California, Davis), 90% of 20 distributors responding said that price/value is now *the* most important factor for consumers in purchasing wine.

It is not as if price hasn't always been important to the consumer, it is just that since the large harvest of 2000 and the recent invasion of inexpensive, high quality, imported wines, consumers have been able to buy better wines at lower prices than in the 1990s.

In addition, one look at the growth of these low-priced, high quality imports over the past three years makes it clear that the Australians are here to stay — along with the Italians, Chileans, Argentineans, South Africans, New Zealanders, and the Spanish. And despite the declining U.S. dollar, they are not going home anytime soon.

New paradigm

The consumer's message — Just give me value! — represents a huge paradigm shift from the 1990s, when all we had to worry about was producing enough grapes and wine to meet the seemingly insatiable growth in consumer demand. Our success back then was really no different than the stock market, or real estate, or virtually everything else — it was all going UP. We didn't focus on "value" because we didn't have to. With the wisdom of hindsight, we can now see what a mistake that was.

But what does this new paradigm mean to us now and in the future? I believe it means the following:

- The "Super Value" wine category is sustainable over the long-term. Two Buck Chuck's $1.99 may be a stretch, but $2.99 isn't — it's a slam dunk, at least in the San JoaquinValley, and consumers don't care where the wine comes from. In addition, as Bob Jennings of Raley's Markets says, these wines don't really attract new customers to Raley's, they just reduce margins. They may have attracted new customers to Trader Joes. They also increased consumption in total, although they produced few new consumers. Existing consumers simply had more wine occasions.
- Consumers want price/value, not just quality, across all price segments (even the ultra-premium segment). The Australian Yellowtail brand concept (fruit-forward, reasonable quality, low price) is selling at a rate of over 5 million cases per year in the U.S. This may be even more of a threat to the California wine industry than Two Buck Chuck.
- In spite of the recent evidence of rising consumer demand, wine prices will continue to fall or remain weak until the perceived "value" of our wines equals the "value" offered by our global competitors. In some market segments, that may take two to three-plus years. As Southcorp America President Tom Burnet said at the Wine Industry Financial Symposium (September 2003): "The best wines — best brands — best values ... will win."
- For independent growers, it means that our costs must decline further if we are to successfully compete in this new era. The real challenge is how to maintain/improve grape quality *while* we reduce costs.

Successful strategies for independents

How do independent growers maintain and improve quality while driving down costs? They need to:

- Standardize activities, to the extent possible, within each vineyard, and for vineyards in the same area. We tend to "tinker" too much with our vineyards, especially on the North Coast.
- Capitalize on new technologies where quality/cost benefits can be realized. The benefits of many of the new technologies are exploding while the costs are falling. It is just like the computer industry.
- Growers need to identify specific farming activities that can be either mechanized (pruning, leafing, harvesting) or consolidated into fewer labor passes through a vineyard. We need to become more labor-efficient.
- Growers also need to identify specific activities that can be eliminated or minimized with little impact on quality (disking, weed control, hedging, and "calendared spraying"). If an activity doesn't improve quality, why do it?
- Growers must use periodic meetings with winery clients to evaluate performance, results, and the cost/benefits of farming activities/strategies.

But in order to make cost-cutting production decisions or to engage winery clients in meaningful discussions of the cost/benefits of specific farming activities and their impacts on wine quality, growers must understand their costs for each and every activity. Furthermore, they need to know how those costs compare to those of other growers in the region, in the state, and, if possible, in other countries.

What new technologies should growers adopt? Consider:

- GPS (global positioning satellite/ GIS (geographic information systems),
- Pressure chambers or other plant water status tools,

- Neutron probes or other soil moisture content devices,
- Remote sensing (such as satellite imaging),
- Automated in-field sensor technology,
- Database management applications.

How can growers improve communication, cooperation, and planning with winery clients? Consider developing specific farm plans detailing all of the farming activities to be performed during the growing season for each winery client and every vineyard block.

Farm plans

Once production costs are known and relative competitiveness is assessed, growers will have the information needed to develop written farm plans. Those plans can then be discussed with each winery client before the season begins in order to gain winery support for the plan.

By discussing and agreeing on how to farm the block before the growing season begins, the grower and the winery can avoid many misunderstandings and conflicts. The plan also provides the basis for evaluating the results at year-end and for agreeing on changes for the next year. We have used farm plans for all of our vineyards and winery clients for the past two years, and the results couldn't be better: better grape quality, better relationships, better financial results.

Effective farm plans must be specific and comprehensive. Our farm plans cover every key area of farming:

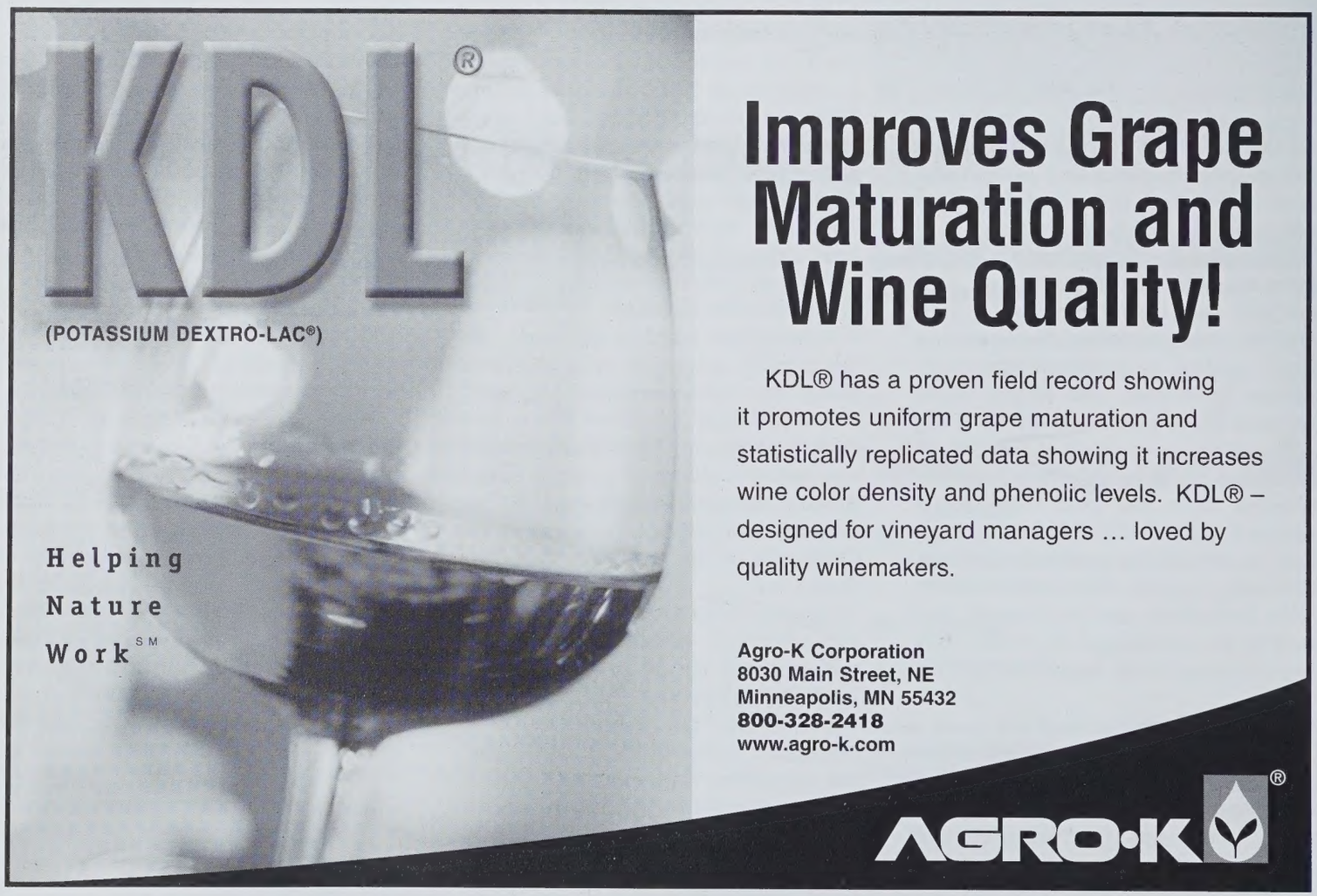
- Cover crop management,
- Soil amendments/fertilizers,
- Pruning,
- Shoot thinning,
- Leaf/lateral removal,
- Weed management,
- Trellis/canopy management,
- Pest/disease management,
- Vine uniformity,
- Fruit thinning,
- Irrigation,
- Harvest,
- Post-harvest.

Do they include costs for each activity, including overhead? Do they lead to a projected budget of income and expense? Does the budget for each winery reflect bottle price/quality differences? Is cost or budget information shared with the winery client?

It seems that costs need to be included in order to discuss cost/benefit of activities. But I doubt anyone wants to share a total budget. Still a grower needs to know projected net income in order to effectively negotiate with a winery.

Developing farm plans is a year-round endeavor that needs to be integrated into the grower's daily operation. As a grower, you should:

- Develop detailed farming strategies for each key farming area for the coming crop year in January/February.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• Review the detailed farming strategies with your winery clients and modify them as necessary by the end of February. Try to provide "final" farm plans to your wineries as early as possible (by mid-March). This will help start the year on a positive note.
• Meet regularly with winery clients to review progress, especially at critical times (bloom, veraison, pre-harvest, etc.) and adjust the strategies as necessary to deal with unforeseen issues as they arise (such as weather and disease).
• After harvest, prepare "year-end reports" for each winery by the end of November. The year-end reports provide the basis for discussion with the winery about what worked well and what didn't. It also provides the winery with the opportunity to give you objective feedback

In the interest of improving communication and cooperation with the winery, it is also critical to be able to taste the wines made from your grapes. Tasting the wines with the winemaker provides tremendous insights into what flavors and characteristics the winemaker is seeking from your grapes. It is also your "report card."

The feedback allows you to assess the effectiveness of your farming strategies in producing winegrapes of the quality sought by the winery. Such feedback meetings also provide the opportunity for you to compare "your" wine with wines from other growers' grapes. You can then discuss how to make positive changes and modifications for the following year. Those agreed upon changes are then incorporated into the following year's farm plan.

Conclusion

As with everything in life, the theory always seems simpler than the reality. Success in the 1990s was relatively easy. Success in the 2000s will be a lot tougher.

We, as independent growers, must change how we operate in the future in order to be successful. We must be smarter about running our businesses.

We must plan and be better prepared to execute efficiently and well.

We must communicate more effectively with winery clients.

We must find new ways to help winery clients produce greater value for *our* consumers in common.

If not, we may find that *our* consumers have defected to someone else. ■

James Verhey is a partner in UCC Vineyards, and its sister company Silverado WineGrowers, which owns and manages over 2,000 acres of premium and ultra-premium vineyards in the Napa, Sonoma, Lodi, and Monterey winegrape regions of California.

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Avoiding "green" characters in Cabernet Sauvignon

BY Dr. Erika Winter[1,2]
[1]Cooperative Research Centre for Viticulture
[2]Department of Primary Industries Victoria, Australia

Many grapegrowers can produce fantastic Cabernet Sauvignon fruit. However, each new season challenges even the best viticulturists to reproduce a characteristic flavor and aroma spectrum.

Generally more than other reds, Cabernet Sauvignon has a tendency to produce a strong "green" herbaceous character, which when in excess, is likely to impart an unpleasant flavor and aroma to red wines. Herbaceous character can be influenced by management practices if the origin of this flavor is understood.

Herbaceousness can be caused by methoxypyrazine (predominantly green pepper-type herbaceous), certain unripe monomeric phenolics (mainly bitter-herbaceous), or polyunsaturated fatty acid derivatives, such as hexanal and hexenal (hay-type herbaceous).

Cabernet Sauvignon is believed to be a close relative of the wild *Vitis vinifera* varieties.[9] It can grow rapidly and loves to put its carbohydrates into shoots, which may lead to shading of the grape bunches. The grapes have thick skins full of color and phenolics with a high seed-to-pulp ratio of 1:12 (compared to Semillon, for example, with a ratio of 1:25). Because of the generally higher number of seeds and also a high skin-to-pulp ratio, it is important to pay attention to seed and skin maturity.

Green pepper-type herbaceous notes

The compound methoxypyrazine has a very low perception threshold of 2 ng/l,[11] which is equivalent to two berries in a million tons of grapes. Only a few laboratories in the world are equipped to measure methoxypyrazine, but the human nose can easily detect it at 15 ng/l.

French researchers have found methoxypyrazine to be very water-soluble, so extraction in the fermentor happens very quickly. Pressing time, skin contact, or pumping over had very little influence on final concentration.[12]

In the vine, methoxypyrazine content can be very high in stems and leaves. A large proportion of leaves in the must or exposing stems to significant extraction could lead to higher levels of methoxypyrazine.

Methoxypyrazine content in the berry changes with time. Unripe seeds contain methoxypyrazine, so if seeds are still unripe at harvest, they can impart green pepper-like aroma to the wine. After veraison, the methoxypyrazine content in seeds declines and may be negligible at harvest, whereas the compound may still be present in the skins. Skin methoxypyrazine levels naturally decline also; however, this decline depends on the mesoclimate, soil, and management practices.

Australian research has shown that, in cloudy locations or in shaded clusters, natural methoxypyrazine degradation during ripening is slower. A linear relationship was seen between the number of layers of leaves over bunches and methoxypyrazine concentrations at harvest. Highest contents were found under three leaf layers and lowest in fully exposed bunches.[1] Thus, bunch exposure assists in getting lower green-pepper character in Cabernet Sauvignon, but in warm regions, there is always a danger of excessive heat loads and sunburned fruit in fully exposed bunches.

In Bordeaux, D. Roujou de Boubée and colleagues found that, when bunches had similar light exposure, better-drained soils led to a faster decline in methoxypyrazine levels than less well-drained soils.[13] It would be interesting to investigate the effect of hormonal signals in response to abundance or lack of water and nitrogen and their effect on methoxypyrazine decline.

In a two-year study, the group in Bordeaux also found that, on the same soils and despite more sunshine, methoxypyrazine was higher at harvest during the second year. They attributed this to higher rainfall before and after veraison that year. These researchers also made an interesting discovery for practical viticulture, as they found that the decline of methoxypyrazine in berries followed almost exactly the same curve as the decline of malic acid. In contrast to methoxypyrazine, malic acid can be more readily measured in a lab or with test sticks.

Bitter herbaceous flavor

Phenolic compounds can impart bitter tasting herbaceous flavors to grapes and wine. Monomeric, dimeric, and trimeric phenolics in grapes and wine may evoke herbaceous bitterness as a taste sensation in the mouth.

Phenolics in seeds and skins serve as building blocks for seed encasement and have other protective purposes.[18] These compounds increase rapidly in the seeds and skins about two to three weeks before veraison.[2,3] Viticultural practices may influence their quantity and quality.

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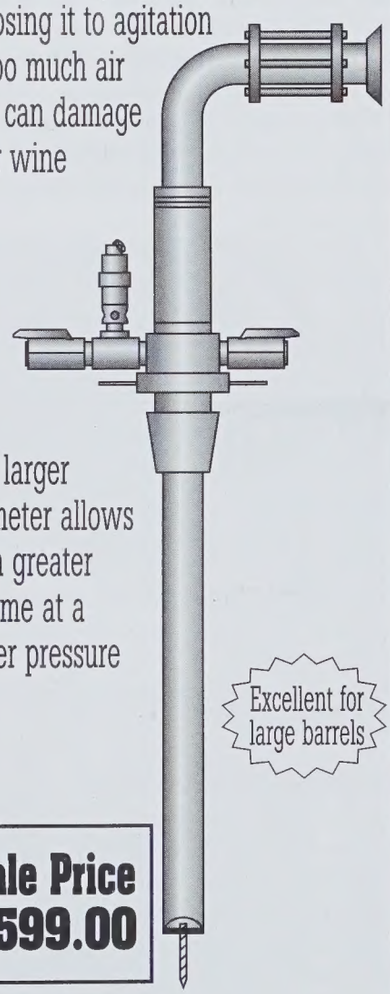

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Ripe skins have a high proportion of polymeric phenolics, which either have associated with anthocyanin to become tannins (possessing an astringent mouthfeel and no bitterness) or have bound to polysaccharides or proteins (inducing a softer mouthfeel). Ripe seeds have very few bitter phenolics left and contain high amounts of tannins, which taste like dark, toasted bread or coffee beans when ripe.

In one Australian tannin research project, drought stress after veraison, lack of functional leaves, or uneven shoot growth with too few leaves on some shoots resulted in an increased proportion of bitter phenolics in Cabernet Sauvignon wines.[6]

Regulated Deficit Irrigation (RDI) after fruit set shortens the cell division phase.[8] This mainly reduces berry size. However, if this stress is extended for too long (well into veraison) or is too harsh, phenolic production or development may be disturbed.[7] Cabernet Sauvignon, which has high levels of phenolics in skins and many seeds, may need a different RDI treatment than Shiraz, for example (personal communication. M. G. McCarthy).

Avoiding high methoxypyrazine levels at harvest

- High water content in soils before and after veraison seems to delay or offset methoxypyrazine degradation. Soil moisture monitoring is important to ensure neither too much nor too little moisture at this crucial phase.
- Sun exposure of bunches speeds up natural methoxypyrazine decline. It is very important to check vine balance before veraison in the form of leaf area to expected fruit weight ratios to prevent excessive canopy development, which leads to fruit shading.[16] Some trellis structures are more beneficial than others in this respect.[14]
- Removal of leaves that shade clusters, when done well before veraison, can be used to decrease methoxypyrazine concentration. In order to avoid sunburn in warmer areas, it is beneficial to have some canopy shade from the midday sun but to allow exposure to morning and late afternoon light.[16] This works best with north-south row orientation.
- Methoxypyrazine decline after veraison follows the decline in malic acid. Since malic acid is decomposed faster as night temperatures increase, warm nights may also assist in reducing methoxypyrazine levels.
- Unripe seeds have high methoxypyrazine levels. Seed ripening seems to need continuous warmth on bunches but no excessive heat loads (maintaining bunches at less than 35°C) and optimum soil moisture. Berry sensory analysis before harvest can reveal lack of seed ripeness.[17]
- Duration of skin contact in the fermentor does not appear to be crucial, but avoiding leaves and stems in the must is important.

Enhancing phenolic maturity

- Extremes of water availability before and after veraison may cause imbalances in the phenolic development of the fruit. Measurement of vine and soil water status is important, particularly if RDI is practiced.
- Vine balance is crucial. Inadequate leaf area-to-fruit weight ratios seem to slow phenolic ripening.
- Bunch temperature seems to influence phenolic ripening. Bunch exposure can be influenced through vine vigor, foliar management, trellis type, row orientation, and vine spacing. Berries should be in the optimum range for enzyme activity (15 to 35°C) as many hours of the day and as many days during the year as possible. Thus open canopies and leaf removal in the fruit zone are beneficial in cooler winegrowing areas as they provide more hours of warmth on fruit. During hot spells or in warmer areas, clusters may need additional foliage-wire manipulation to provide dappled midday light on grapes.

The influence of vine balance on phenolic development of Cabernet Sauvignon may warrant special attention. Desirable phenolic and sugar levels were achieved only when a relatively high ratio of leaf area-to-fruit weight (14 cm^2/g) was ensured in a study of Italian Cabernet Sauvignon.[10b]

The effect of degree of bunch exposure and "hang time" on phenolic ripening is currently being investigated in several countries. Monitoring biologically active degree hours (a summation of optimum temperature time for grape bunches) may provide a new tool to monitor phenolic development[5].

"Hay-like" herbaceous flavor

Little is known about viticultural practices that influence formation of grape lipids, the precursors of herbaceous aromas. Lipids are produced in green tissue, such as stems and unripe berries. Formation of herbaceous flavors involves the activity of lipoxygenases and hydrolases before and during fermentation.

The quantity of these enzymes depends on the amount of green matter at harvest, enzyme inhibition by SO_2 after harvest, and contact of the berries with oxygen. Post-harvest grape handling that reduces oxygen contact is a preventative measure against hay-type green characters.[4]

Conclusions

It is interesting to note that in a study of Cabernet Sauvignon wines from six sites in New Zealand, the two wines with the highest tasting scores had very low (5.7 ng/L) and very high (15.9 ng/L) methoxypyrazine levels.[15] The distinguishing sensory traits of the two outstanding wines compared to wines from other sites were the fine tannins (and blackberry notes).

In both wines, the high tannin scores were positively correlated with the rate at which malic acid levels in the berries decreased. Faster rates of malic acid decline may have been due to the relatively drier soils of the two sites in that year. Such rapid decline of malic acid and such high tasting scores could not be achieved on the same sites in the subsequent year when high rainfall occurred before veraison.

Water management is one of the big tools in grapevine quality management. Soil moisture monitoring should be accompanied by measurement of internal indicators of plant water status. Malic acid decline in bunches may be used as a new marker, in particular for methoxypyrazine decomposition and phenolic ripening. In Bordeaux, J. Blouin and G. Guimberteau note that malic acid levels observed over 74 years in Cabernet Sauvignon were a good indicator of the ripening characteristics of each year.[2] ■

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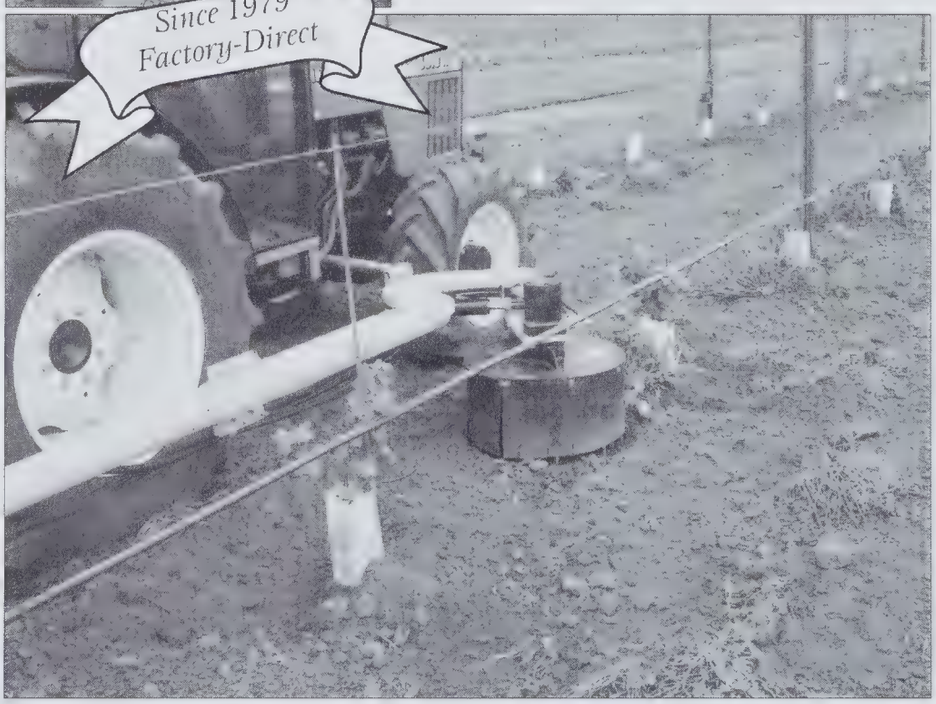

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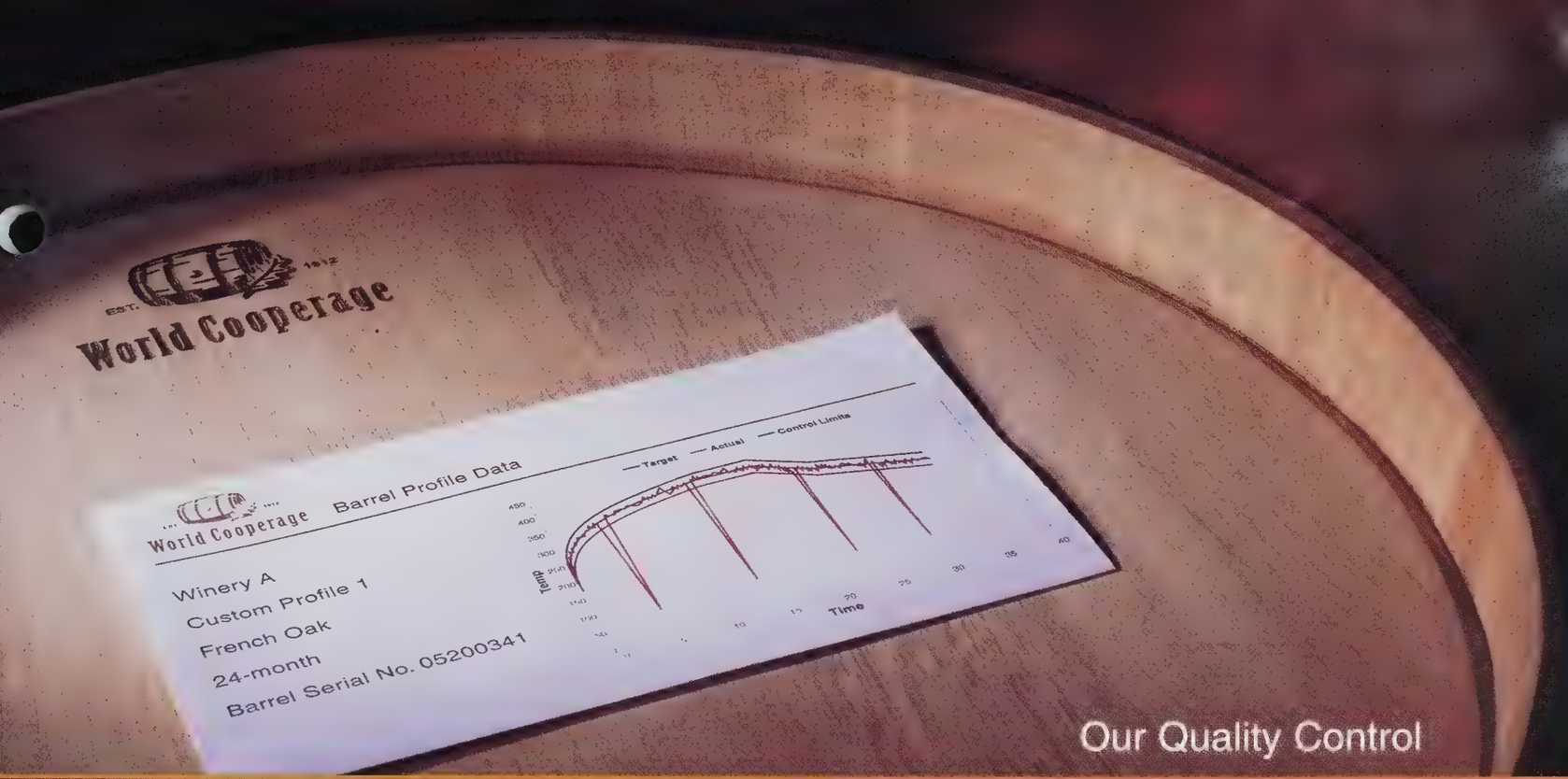

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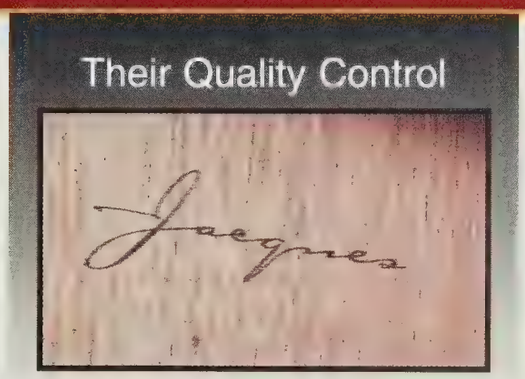

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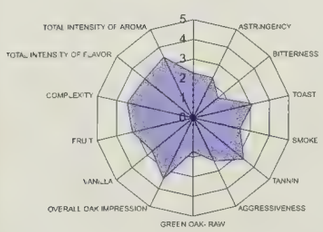

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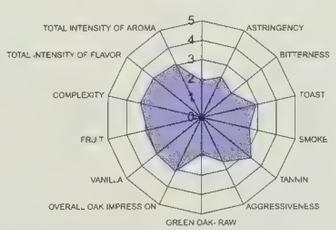

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CASE HISTORY

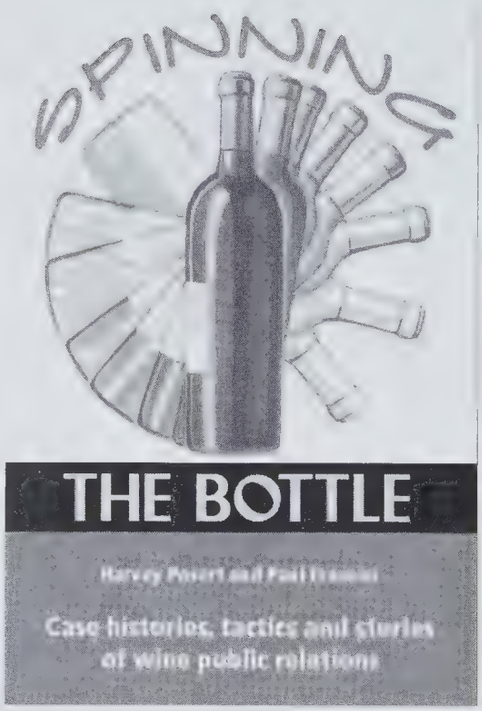
Kendall-Jackson turns adversity to advantage

BY James Caudill

The plan was well thought out, or so it seemed. Advice had been sought and followed from experts at the local university, who briefed vineyard managers about regeneration, wildlife corridors, and mistakes made in the past that should and could be avoided. Consultation had taken place with local community leaders and elected representatives. Project planners expected no surprises, only support for a model vineyard development.

It didn't work out that way.

During a period of rapid vineyard expansion in the mid-1990s, Kendall-Jackson Wine Estates had already been singed — a sort of early warning alert — when it removed some oak trees during a vineyard development project in Sonoma County. Pulling oak trees from the ground made front page news locally, even as K-J's clean-up of nearby Sausal Creek, where old cars were pulled from the streambed and habitat was restored, didn't rate a word.



In Santa Barbara County, rolling oak savannahs framing Highway 101 as it headed north were rapidly being converted to vineyards, not just by K-J but by several farming operations. Unfortunately, they tended to run together, and the impact of hundreds of acres was far more dramatic as a result.

At the former Barham Ranch, dotted with more than 10,000 oak trees, Kendall-Jackson planned to develop less than half of the land, leaving most of it in open space, a needed rest from over-grazing by cattle historically found in these canyons. Work on this project began in 1997.

For the 600 or so acres that would be planted, an average of 1.5 trees per acre would be removed. Replanting would occur at a ratio of 10 trees for each one taken, grown on-site from acorns nurtured to seedlings, then irrigated for several years until safely rooted. Wildlife corridors would run through the vineyards, allowing free and easy passage for native animals heading toward water. Rubber-tracked vehicles would be used to lessen the potential for erosion.

When the bulldozers began developing the vineyard, drivers on the nearby highway didn't see Kendall-Jackson's careful plan. They weren't individually briefed on restoration. Instead, they saw nearly 1,000 trees taken from the ground, piled high in burn piles to dry and be disposed of after salvageable wood was removed.

An environmental firestorm erupted, and everyone in the industry began to realize that vineyard development would never occur again without painstaking and protracted oversight.

It was a perfect public relations storm. Before it was over, waitstaff in restaurants boycotted K-J wines, refusing to serve customers. Local environmental groups filed lawsuits (which, for the record, K-J later successfully defended, since it had carefully followed all rules and regulations then in effect). Elections were held to stop the cutting of virtually any tree, and recall campaigns were launched against local officials, regardless of which side of the issue they were on.

Wineries had always seen vineyards as beautiful open space, the last bastion of agriculture that would save land from subdivision and development of strip malls and tacky suburban excess. Most vintners were stunned, and none more than Kendall-Jackson.

As grow tubes went in to protect young vines, vineyard managers could look ahead and visualize a verdant green oasis, watched over by raptors drawn to the roosts and owl boxes they provided. But in the *Los Angeles Times*, one local resident described a different scene. Where vineyard managers saw future beauty, she said the carefully aligned rows of tubes and milk cartons resembled nothing so much as a national military cemetery, symbolic headstones for a lost ecology that had been disrupted for a product seen not as food, but as sin.

Granted, K-J planners, consultants, and public relations staff should have more thoroughly researched the potential visual impact of the development, in order to help craft a more detailed plan that would gain understanding, if not support.

As tensions escalated, it became apparent that public relations was going to be the only effective way out of the growing morass. The Internet as a briefing tool was only beginning to be effectively used at that time. Kendall-Jackson had become a lightning rod for environmentalists opposed to vineyard expansion. It was regularly charged with evils large and small, mostly built on fabrication, exaggeration or a skewed view of the facts.

In this atmosphere, fighters within K-J wanted mostly to fight. There was, however, a champion for careful, rational

BOOK EXCERPT

action, and the value of seasoned leadership was never more proven than in the response that was ultimately crafted.

Kendall-Jackson co-founder Barbara Banke set the tone and direction that would change Kendall-Jackson's fall from grace into a new opportunity for understanding and cooperative effort.

Having followed all regulations, Kendall-Jackson had done nothing technically wrong. In fact, having sought out assistance to plan a model vineyard that would feature restoration and protection in equal measure with development, there was a good story to tell. So rather than apologize, K-J began to communicate.

Critical phone calls, letters, and e-mails came in regularly, and every single one was answered personally with a review of what had actually been undertaken and accomplished. One noted exchange with wine critic Hugh Johnson was published in *Harper's*, a British wine trade magazine. Johnson was initially critical of the project until he heard a more complete report, after which he wrote a personal note saying he wished he'd not been as hasty to criticize as he had been.

Local reporters were briefed and briefed again on the original plans, and how those plans were being put into action. By responding quickly to media inquiries, K-J followed a strategy not to let the story grow faster and further, becoming a national cause célèbre.

Contact was made with the California Oak Foundation — one of the loudest critics of the winery — and the executive director agreed to come to the ranch and hear the story firsthand, making her own journey of discovery. From that early contact grew cooperative efforts which found Kendall-Jackson working to underwrite additional oak research, conduct oaks-in-the-vineyards workshops, and support educational outreach

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This is an excerpt from *Spinning the Bottle: Case Studies in Wine Public Relations*, a collection of 48 case studies and guidelines for promoting wine, wine companies, and wine-related issues. More than 40 experts, including wine publicists, marketing experts, and association officials, tell how they conducted winning public relations campaigns. The studies were collected by public relation experts Harvey Posert and Paul Franson, who live in Napa Valley.

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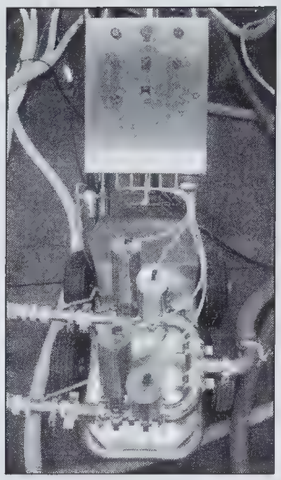

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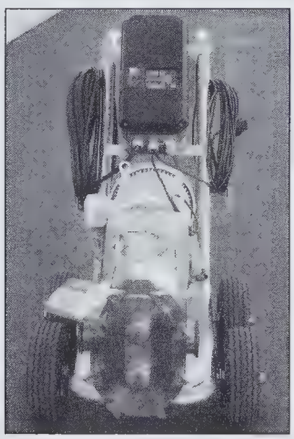

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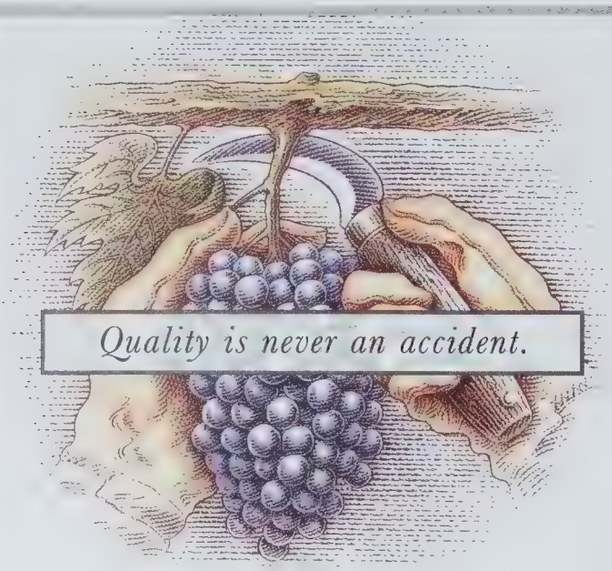

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on oak restoration to California schoolchildren and elected officials.

Foundation officials helped Kendall-Jackson construct a carefully considered pledge not to cut endangered species of oak trees, to continue restoration efforts on its own ranches, and to support similar efforts underway throughout the state.

A review of farming policy led Kendall-Jackson to announce, to the astonishment of many present at a meeting of the Sonoma County Grapegrowers Association, that it would not only no longer cut trees in vineyard development, but that it was banning the use of methyl bromide and several other pesticides that threatened groundwater. While many others were also following such policies, none had stepped forward to say so publicly. (Their hesitation to do so rested on strategic political considerations of avoiding any discussion whatsoever on the widely assumed "natural" process of grapegrowing.)

While making no effort to train the spotlight on its environmental program, Kendall-Jackson suddenly found itself being cited by environmentalists now not as the evil empire but as an example of an enlightened grower capable of consulting with, and responding to, community needs.

At the same Barham Vineyard where controversy once reigned supreme, visitors from government, environmental groups, and other vintners now come for visits to see, finally,

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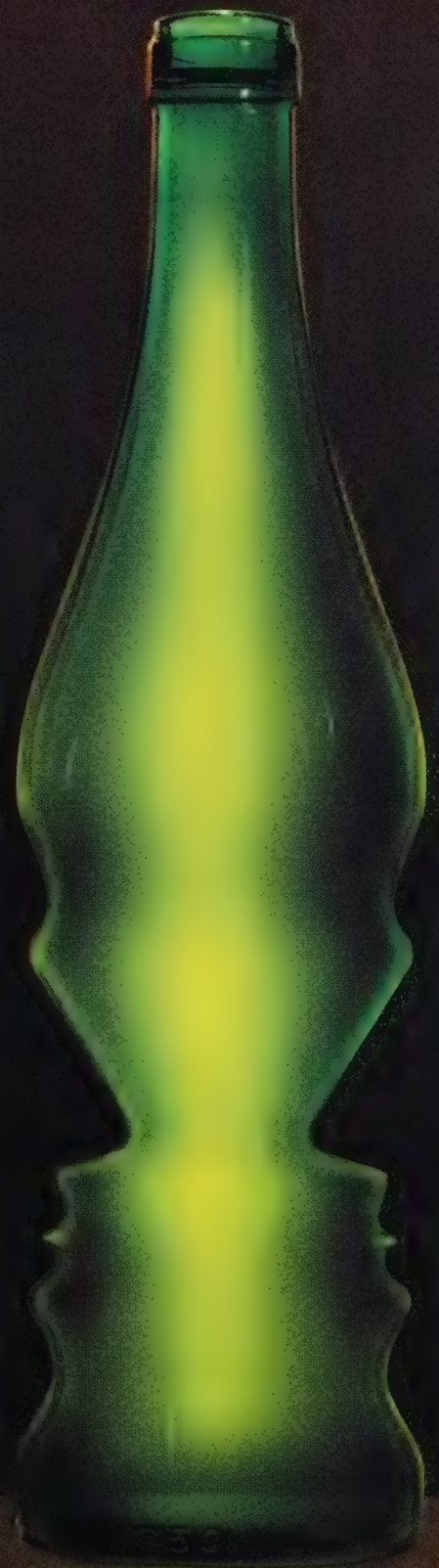

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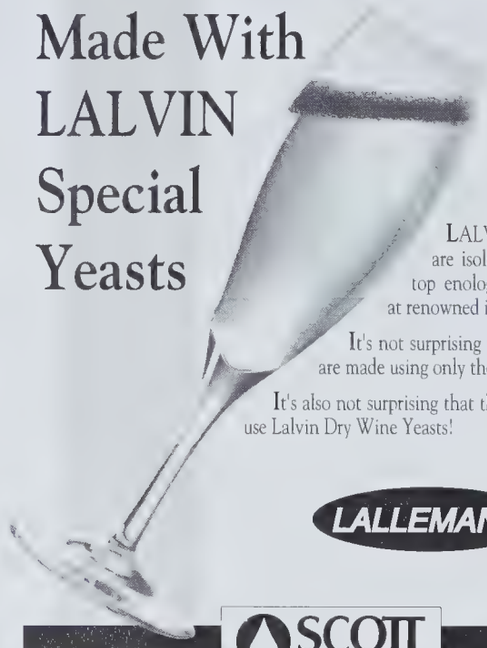

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PWV UPDATE:

Barham Ranch Vineyard today

Kendall-Jackson Wine Estates now farms a total of 516 acres on the old Barham Ranch property, the scene of K-J's Santa Barbara County oak tree controversy. Central Coast vineyard director Bob Johnson brought *PWV* up to date on tree and wildlife management of the property.

"We have been tracking the progress and health of trees on the property from the very beginning," says Johnson. "We took out less than 10% of the trees originally found there to plant vineyards and replanted thousands more elsewhere on the ranch."

Johnson explains that a mixture of "active" replanting and "passive" encouragement of trees has culminated in over 8,000 seedlings growing on the ranch. Vineyard workers have kept a count of acorns left to take root and the resultant seedlings; they have also been monitoring the health of new trees. "We got a big boost in 1998 because it was an El Niño year," Johnson reports. "A lot more passive rootings took place that year."

There are two creeks on the property, one of them the San Antonio, which is a declared steelhead habitat and thus protected by government oversight. Vineyard managers monitor creek health but have not had to step in and help these habitats.

Wildlife corridors in the vineyards and surrounding areas are thriving. Workers have spotted deer, raccoons and many birds, such as woodpeckers. "The raptor population has steadily increased over the last 10 years," notes Johnson, "which is very helpful for gopher control." K-J has installed two dozen owl boxes at random locations in the vineyards.

The majority of the old Barham cattle ranch was grazed lands; K-J is leaving these unplanted areas alone to slowly revert to a natural, healthier state. Nearly 10 years on, K-J continues to follow its plans to create a model vineyard while protecting and restoring the Barham Ranch property.

—Tina Vierra

how careful planning can allow for a vineyard environment that supports and enhances ecological health. Oak seedlings have been catalogued and followed through regeneration, and a vibrant eco-system exists. This process is ongoing, as all parties continue dialogue without the rancor and polarization that had typified the past.

When the U.S. Environmental Protection Agency awarded a series of Stratospheric Ozone Protection Awards in 2002 in Washington D.C., there were two wineries among those honored from industries and organizations throughout the world. Fetzer Vineyards, long known for its sustainable business practices and leadership in organic farming, and

Kendall-Jackson, a once unlikely partner in environmental leadership, were cited as examples of good stewardship.

A simple public relations premise — communicate, rather than withdraw — and a courageous leader carried the day.

The public relations lessons are easy, but carrying them out, particularly in a highly charged atmosphere, is anything but.

- Don't run, you can't hide: *communicate.*
- Tell your story. Carry the story forward. Don't let it carry you.
- Keep the conversation going, even if it hurts.
- Listen well, and learn.
- Allow yourself to get caught in the act of doing something good.

Jim Caudill served as vice president, public relations for Kendall-Jackson Wine Estates from November 1996 to January 2003. As a wine industry consultant, he has worked for Chalone, Beringer Blass, and Brown-Forman Wines. He is a fellow of the Public Relations Society of America and a three-time winner of the Silver Anvil, the "Oscar" of the public relations industry. After a career as a journalist, he served as a top management consultant for several major public relations agencies, including Carl Byoir and Ketchum Communications, and as vice president, public relations for Amfac Hotels & Resorts. Email: JamesMCaudill@yahoo.com.

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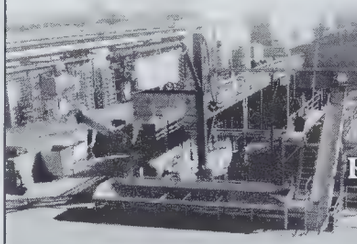

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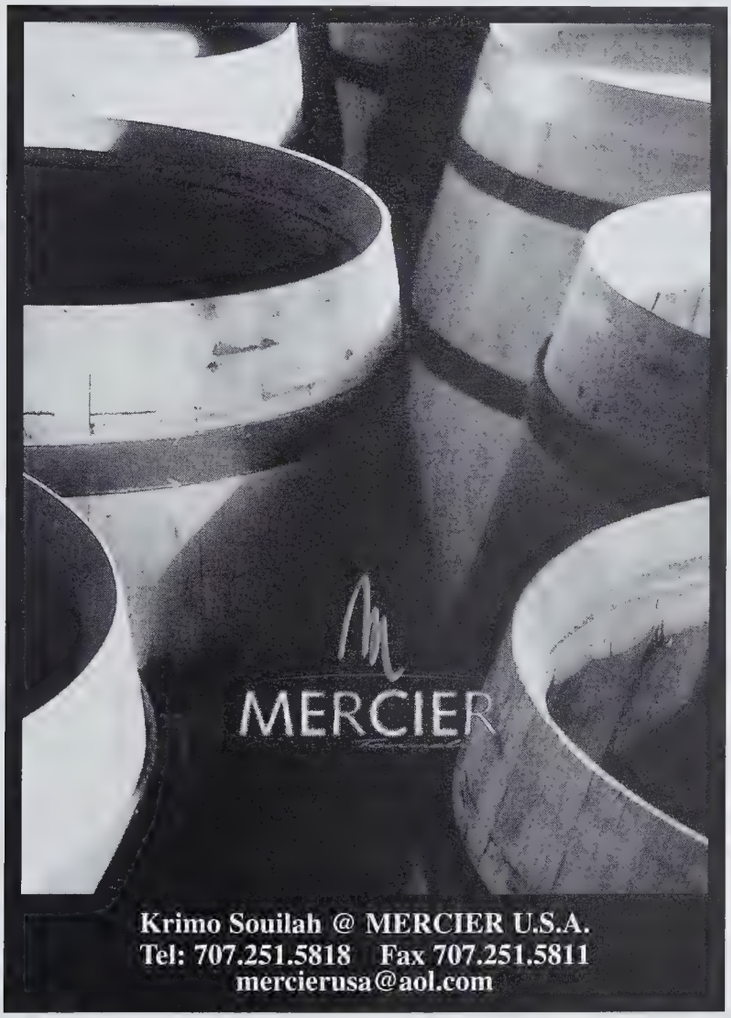

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Affected Syrah in the foreground: third leaf Syrah "Shenandoah" clone on 5C rootstock, with strong symptoms. Adjacent block (background) not affected.

SYRAH IN CALIFORNIA
Decline or Disorder?

BY **Mark Battany,**
UC Cooperative Extension,
San Luis Obispo, CA
Adib Rowhani,
Plant Pathology Specialist
Deborah Golino
Extension Specialist
Department of Plant Pathology
University of California, Davis

Growers of Syrah in California vineyards have observed a variety of symptoms in recent years that suggest this popular variety may be subject to unique problems. Reports include cases of leaf reddening, scorching, swollen graft unions, and stem necrosis symptoms. These symptoms are often associated with genetic incompatibility and/or virus infection.[5]

Some viticulturalists have expressed concern that affected vineyards might be showing symptoms of the disease known in France as "Syrah Decline." At this time, the cause of that disease is unknown.

The authors of this report conducted an extensive survey of California Syrah vineyards in 2002 and 2003. The survey did not confirm the presence of Syrah Decline in California. Rather, most affected vineyards were found to have problems that resulted from environmental stress or poor cultural practices.

In addition, on the Central Coast, significant acreage is affected by a problem we are calling "Syrah Disorder." We believe Syrah Disorder is a separate problem from Syrah Decline and propose some possible causes later in this report.

The French situation

Syrah Decline is a well-documented problem in France.[1,6,7] It is characterized by swelling and cracking of the graft union and early leaf reddening (as early as July; see Figures I and II). French scientists at ENTAV have been studying this problem since 1999 with efforts to determine whether there is any correlation between Syrah Decline and other conditions, such as poor graft unions, crown gall infection, genetic incompatibility, traditional viruses, new viruses, fungi, viroids, and environmental interactions.

At this time, our French colleagues have concluded that the problem has no simple explanation. Consequently, they are investigating solutions involving a number of possible causes, including new, unknown viruses.

California statewide survey

In 2002, we began our statewide survey of Syrah sites to determine whether the disease Syrah Decline, as reported from France, occurs in California. Our goals were to visit Syrah sites in which problems have been observed, including graft union abnormalities and reddening of leaves;

Affected vine on left, unaffected vine on right. When vines are affected, generally the entire canopy shows symptoms rather than individual leaves and shoots.

Swelling and cracking at the graft union characterize the Syrah Decline disease in France.

to test selected samples for pathogens by using molecular and biological assays; and to establish a small field trial with Syrah grafted onto select rootstocks to attempt to induce observed symptoms.

Growers, UC faculty, and Cooperative Extension staff were asked to help us identify possible sites based on symptoms. Seventy-seven Syrah vineyards in 10 California counties were surveyed and inspected in 2002 and 2003. Counties included Calaveras, El Dorado, Madera, Merced, Napa, Sacramento, San Joaquin, San Luis Obispo, Sonoma, and Stanislaus.

Twelve clones, seven field selections, and 12 different rootstock varieties were represented (Table I), and more than 50 different combinations of clone and rootstock were observed (Table II). Geography ranged from central San Joaquin Valley to Sierra foothills to coastal valleys, with temperatures as high as 110ºF and as low as 19ºF.

All vineyards were drip irrigated, and many vineyard managers reported practicing deficit irrigation to control vigor. Many were planted as green-growing benchgrafts, some as dormant bench-

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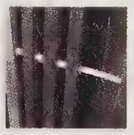

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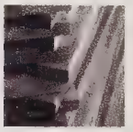

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grafts, and others as field-budded vines.

Observed symptoms included mild and severe vertical cracking on the trunk, interveinal burgundy red leaves (typical of leafroll-virus symptoms), leaf-margin reddening and necrosis, and swelling at the graft union.

No strong pattern emerged between specific management practices, site, clone, rootstock, or type of planting material, and observations of symptoms or reports of problems. Individual healthy vineyards were observed planted with all the common Syrah clones, making it unlikely that a disease carried with propagative materials was involved.

In many cases, symptoms in problem vineyards could be attributed to specific factors, including frost damage of young vines, water stress (including lack of water to young vines and poor drainage), poor planting and training techniques (Figure III, IV), and other factors causing root stress, including known presence of Armillaria root rot.

Only in the Central Coast were problem vineyards observed for which no obvious environmental or management problem

Table I: Survey of Virus Test Results in California Syrah Vineyards

	Clone/ Selection	# Vineyards Surveyed	Rootstocks	Virus test results
1	Syrah FPS 01	4	110R, 99R, Freedom, Teleki 5C,	No virus detected.
2	Syrah FPS 07	4	101-14, 420A, Schwarzmann, SO4	No virus detected except RSP in 2 vineyards.
3	Syrah ENTAV-INRA 99	2	3309C, 99R	No virus except RSP in 2 vineyards.
4	Syrah ENTAV-INRA 100	3	3309C, Freedom, Teleki 5C	No virus except RSP in 2 vineyards.
5	Syrah ENTAV-INRA 174	6	110R, Freedom, SO4, Teleki 5C	GLRV2 detected in 1 vineyard. RSP detected in 5 vineyards.
6	Syrah ENTAV-INRA 383	1	110R	No virus detected.
7	Syrah ENTAV-INRA 877	4	101-14, 3309C, Freedom, Teleki 5C	No virus detected except RSP in 4 vineyards.
8	Syrah Estrella	15	101-14, 110R,1103P, 140Ru, 44-53M, Freedom, Kober 5BB, Teleki 5C, own roots	No virus detected except RSP in 1 vineyard.
9	Syrah Noir	8	101-14, 110R, Freedom, Kober 5BB, Teleki 5C	GLRV2 detected in 2 vineyards; GLRV9 detected in 2 vineyards; GVA detected in 1 vineyard; GV detected in 1 vineyard; RSP detected in 8 vineyards.
10	Syrah Beaucastle	2	110R, 44-53M	No virus detected except RSP in 2 vineyards.
11	field selections/ unknown	18	039-16, 99R, 110R,101-14, 3309C, Freedom, Schwarzmann, SO4, Teleki 5C,	GLRV2 detected in 2 vineyards; GVA detected in 1 vineyard; GV detected in 1 vineyard; RPS detected in 5 vineyards.
12	Shiraz FPS 01	3	99R,3309C, SO4	No virus detected except RSP in 1 vineyard.
13	Shiraz	8	101-14,1103P, 140Ru, 420A, Schwarzmann	No virus detected except RSP in 2 vineyards.
Total	More than 12 clones/selections	78	13 different rootstocks	GLRV 2, GLRV 9, GV, GVA detected in less than 4% vineyards; RSP detected in approximately 50% vineyards.

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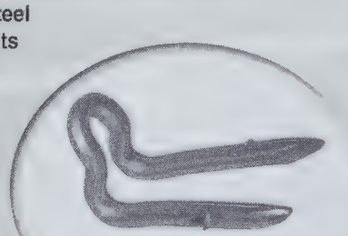

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existed. These vineyards will be discussed in more detail below.

Infection with known viruses (based on test results) did not seem to be a common factor in problem grapevines identified by vineyard managers.

More than 1,500 PCR tests were completed on 132 samples. All samples were tested for viruses that are associated with graft union disorders: leafroll type 2, grapevine virus A (GVA), grapevine virus B (GVB), grapevine virus D (GVD), Rootstock Stem Lesion-associated Virus (GRSLaV), and Rupestris Stem Pitting-associated Virus (GRSPaV). Selected samples were tested for additional viruses. A summary of results is presented in Table I.

Statewide, results were very similar. Approximately 95% of the samples tested negative for viruses typically associated with graft-union disorders. Several samples tested positive for leafroll type 2, leafroll type 9, and for vitivirus.

The general vitivirus primer used for these tests is experimental, detecting the vitiviruses GVA, GVB, and GVD. One would normally expect that a sample testing positive for the vitivirus primer would also test posi-

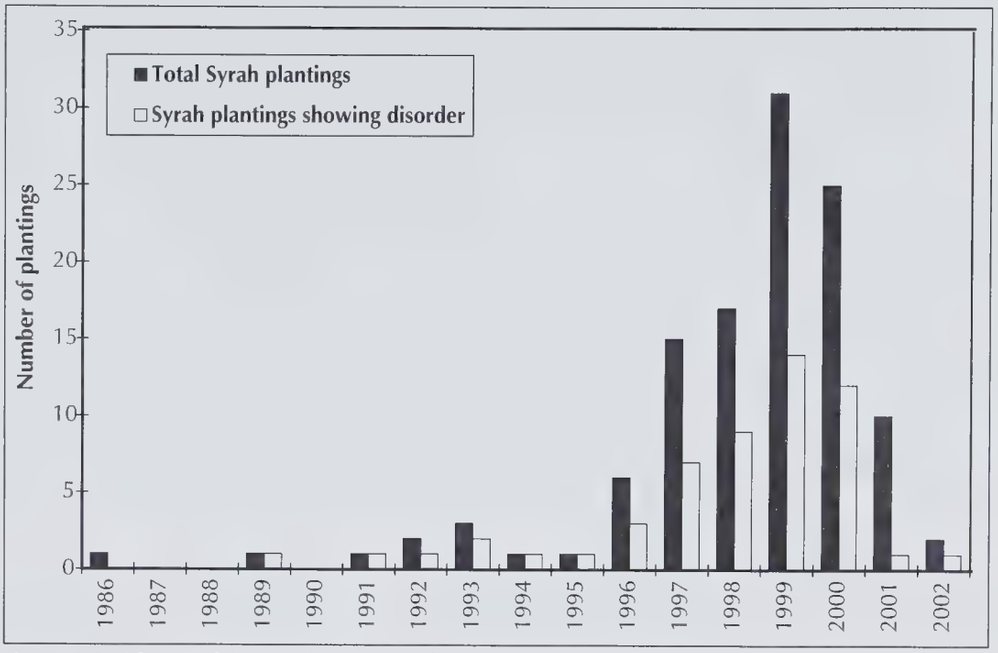

Figure I. Incidence of Syrah Disorder on the Central Coast in 2003, by year of planting.

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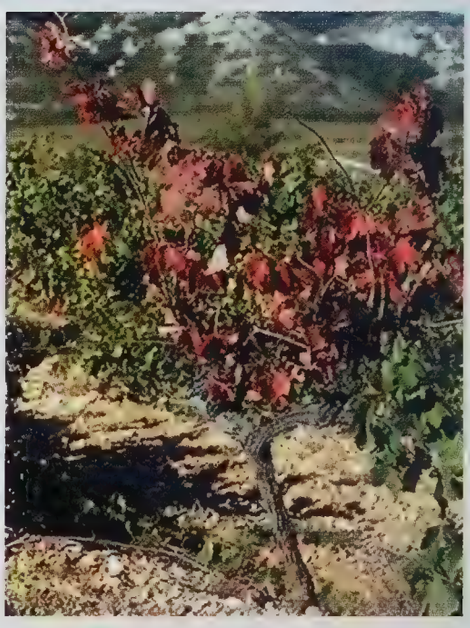
tive for GVA, GVB, or GVD.

However, this was not the case in this study. We are continuing to work on this inconsistency, to explore if there is a different, as yet unidentified, vitivirus in these samples. Although these viruses are sometimes associated with graft-union disorders, we did not get consistent positive results among samples from the same vineyard, neither were they correlated with symptoms.

Approximately 50% tested positive for Rupestris Stem Pitting-associated Virus (RSP). RSP, believed to be a mild virus, is known to be widespread in California. It is not known to cause the symptoms associated with Syrah Decline.



Leaf reddening can occur as early as July when a vine is affected by the French Syrah Decline.

Many sites tested negative for all viruses, yet showed reddening. However, these vines also suffered from large cracks and splits in the bark, which appeared to be due to frost damage. Such damage can also cause leaf reddening. In other cases, plants with no obvious red leaf symptoms tested positive for GLRaV-2, apparently harboring a latent infection.

In general, far less virus was found in Syrah than is usually found in some major grape varieties grown in California. In previous survey work, Chardonnay, Zinfandel, and Cabernet Sauvignon have been tested from diverse vineyard locations and are much more likely to be infected with both leafroll viruses and vitivirus.

We believe that Syrah in California is relatively free of virus problems because it has become popular relatively recently, so nearly all the clonal material in the trade has come from clean stock programs and been tested by formal importation programs.

Syrah Disorder on the Central Coast

Although most problem Syrah vineyards we visited could be explained by cultural or environmental factors, Syrah grown in the warm climate areas of the Central Coast has suffered an increas-

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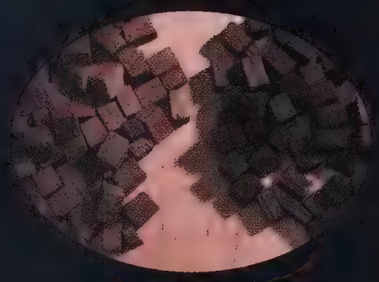

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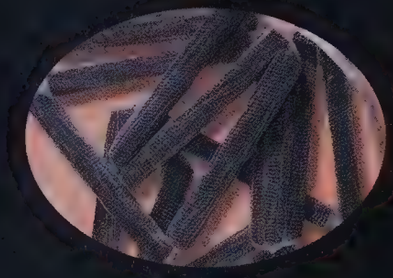

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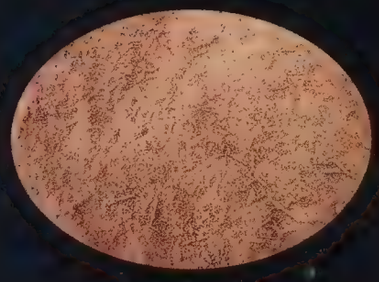

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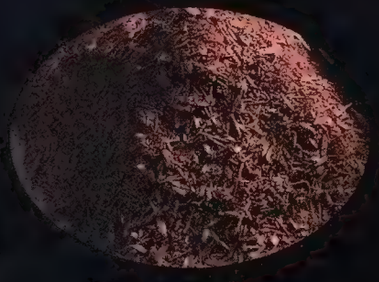

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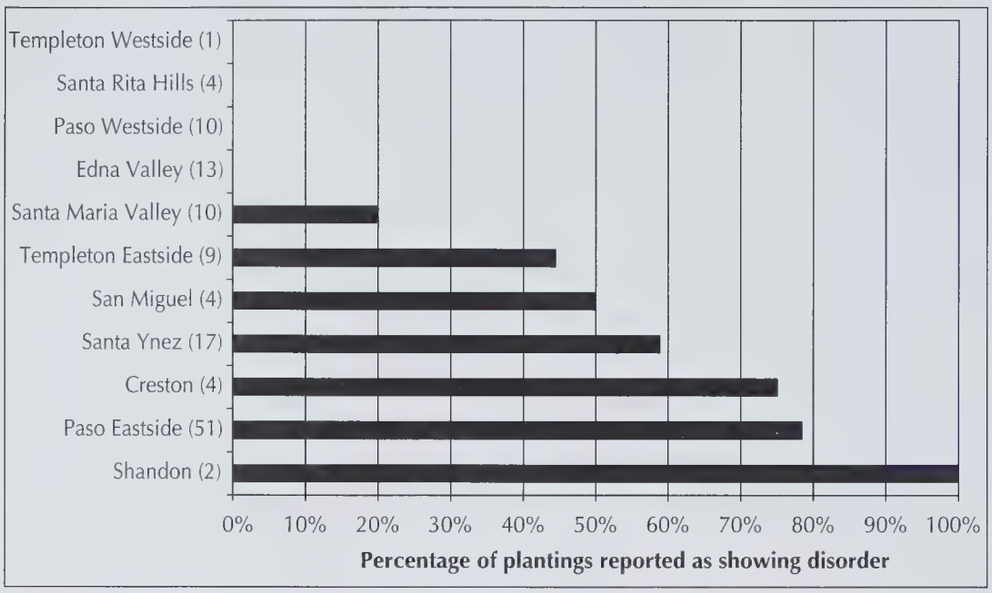

Figure II. Incidence of Syrah Disorder on the Central Coast in 2003, by location. The numbers in parenthesis refer to the sample size for each category.

ing incidence of a generally uniform disorder during the past three seasons. This disorder, which we call Syrah Disorder, appears to be relatively unknown in other parts of California, but has affected significant acreage in this area.

Typical symptoms of Syrah Disorder include:

- Leaf reddening and senescence beginning around veraison or soon thereafter, with visual leaf symptoms that somewhat resemble a blend of leafroll virus, severe potassium or magnesium deficiency, salt burn, and/or severe water stress;
- Limited ripening of the fruit beyond veraison; the resulting juice has very low soluble solids, high pH, high potassium, and very poor color;
- Undesirable, difficult-to-market fruit, and reduced wine quality.
- Adjacent blocks of other varieties under the same management and environmental conditions do not display any similar characteristics to those above.

There are approximately 4,400 acres of Syrah grown in San Luis Obispo and Santa Barbara counties. We surveyed the area's Syrah growers after the 2003 harvest regarding Syrah Disorder. Forty-five growers responded, representing 125 individual plantings of Syrah, Shiraz, and Syrah Noir.

This brief, non-scientific survey requested the planting year, rootstock, clone, location, certification status, and whether or not symptoms were observed in 2003 for each individual planting. Based on the survey results, there were no correlations between occurrence of the disorder and specific clones, rootstocks, or year of planting (Fig. I).

There was, however, an obvious correlation with location: The hotter, drier areas in the Central Coast showed more occurrences of the disorder, while the cooler, wetter areas showed few or no occurrences. For example, in the warmest inland areas east of Paso Robles, 78% of the plantings showed the disorder, and likewise in the warm inland area of Santa Ynez Valley, the percentage was 58% (Fig. II).

Non-certified material was more likely to be affected (Fig. III). Several growers who have had successive poor years with Syrah have resorted to removing the plantings.

Some of the possible causes of the disorder that have been receiving attention among growers include:

- An as-yet unknown virus or other pathogen;
- Graft-union disorders;
- Nutritional imbalances, particularly potassium, magnesium and phosphorus;
- Physical root impairment, such as J-rooting;

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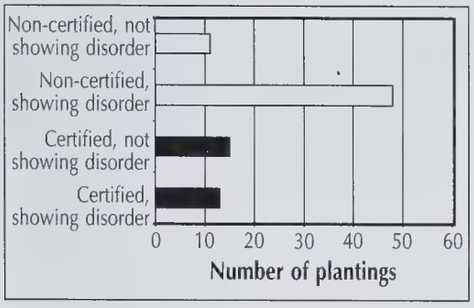

Non-certified, not showing disorder
Non-certified, showing disorder
Certified, not showing disorder
Certified, showing disorder
0 10 20 30 40 50 60
Number of plantings

Figure III. Incidence of Syrah Disorder on the Central Coast in 2003, by planting material certification status.

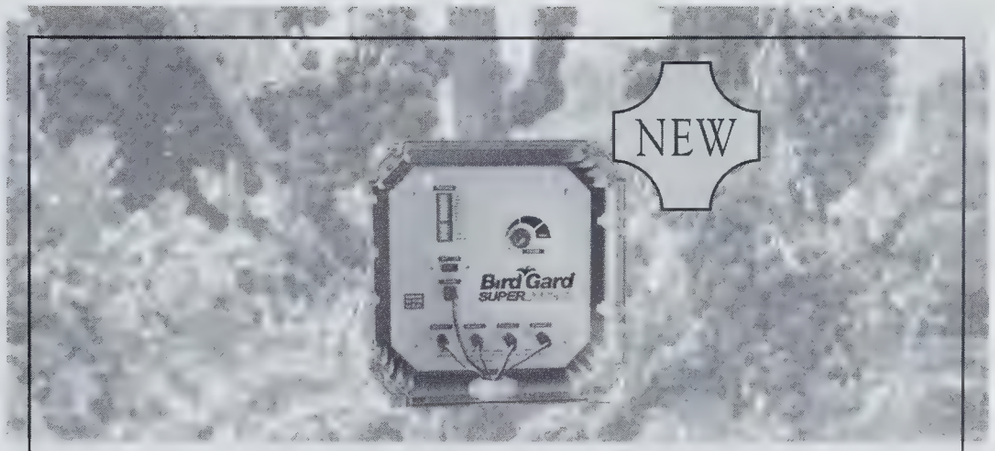
• Increased vine water stress due to recent drought, salinity, and changing irrigation practices;

Based on our 2002 statewide virus survey, we believe that some of the factors above can be eliminated as possible causes of the disorder. Our testing did not indicate that a known virus was responsible for the symptoms that growers are reporting. The majority of growers in the area reported that there were no graft union problems in their affected vineyards.

There does not appear to be any obvious correlation between the disorder and soil or vine nutrient status. Distribution of the disorder across a wide variety of soils tends to decrease the likelihood that a specific nutrient imbalance is the primary cause, particularly when other varieties perform perfectly well under the same conditions, and the same Syrah plantings may have performed well in previous years. Physical root impairments due to improper planting methods could contribute to the symptoms, but again, it is unlikely that only Syrah was planted improperly while other varieties were not.

Perhaps more significantly, over the past five years this region has experienced a significant rainfall deficit compared to historical averages. This time period also coincides with increased adoption of deficit irrigation practices by the local winegrape industry.

Additionally, the groundwater quality in many areas of the Central Coast is fairly marginal, with high salt levels. Without adequate leaching either from winter rainfall or by application of an extra leaching fraction with irrigation, these salts accumulate in the root zone and lead to increased vine water stress over time. The cumulative effect of dry winters, reduced irrigation, saline irrigation water, and increasing soil salinity



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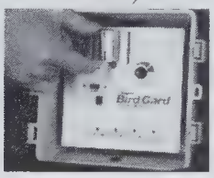

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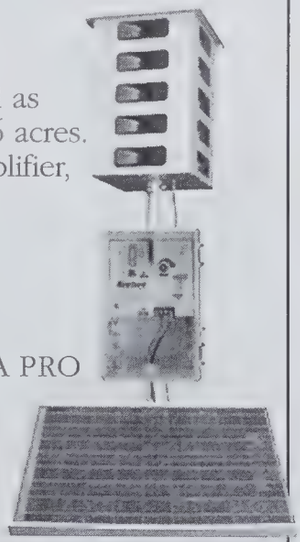

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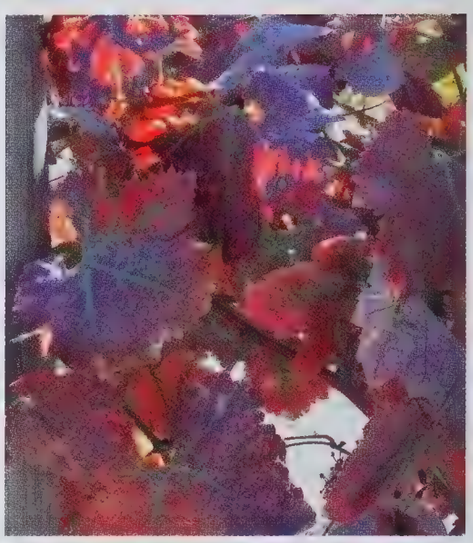
should notably increase vine water stress, with all other factors being equal.

Possible primary factor

The affected areas are also characterized by extreme daily fluctuations in both temperature and evapotranspiration (ET). Daily temperature swings of 60°F are typical, and peak afternoon ET rates can be very high, driven by high temperatures, low humidity, and the strong solar radiation characteristic of the region. These factors, along with the results of some recent research regarding the unusual physiological response of Syrah to drought (discussed below), seem to suggest that excessive water stress may be a primary factor causing Syrah Disorder.



Red leaf symptoms—may be an early stage of the disorder.

H.R. Schultz compared the drought responses of Grenache and Syrah in France and Germany.[12] He showed that Syrah, which originated in the relatively humid climate of the Rhône Valley, has a very different drought response mechanism than Grenache, which originated in northern Spain. Grenache exercised rapid and significant stomatal control under increasing water stress, which placed a lower limit on the leaf water potential attained; this is an example of "near-isohydric behavior." This type of response is considered more typical of vines that have developed an adaptation to severe drought.

Schultz demonstrated that Syrah, in contrast, exercised very little stomatal control, instead responding to drought by continually lowering its leaf water potential while maintaining full transpiration; this is an example of "anisohydric behavior." Such a response may be more typical of vines that evolved where drought is rarely severe; that corresponds well to Syrah's area of origin.

In earlier work, Schultz compared the drought response of Syrah and Grenache in France and determined that Syrah showed very little adaptive response to water stress other than lowering the leaf water potential at which leaf turgor was lost.[13]

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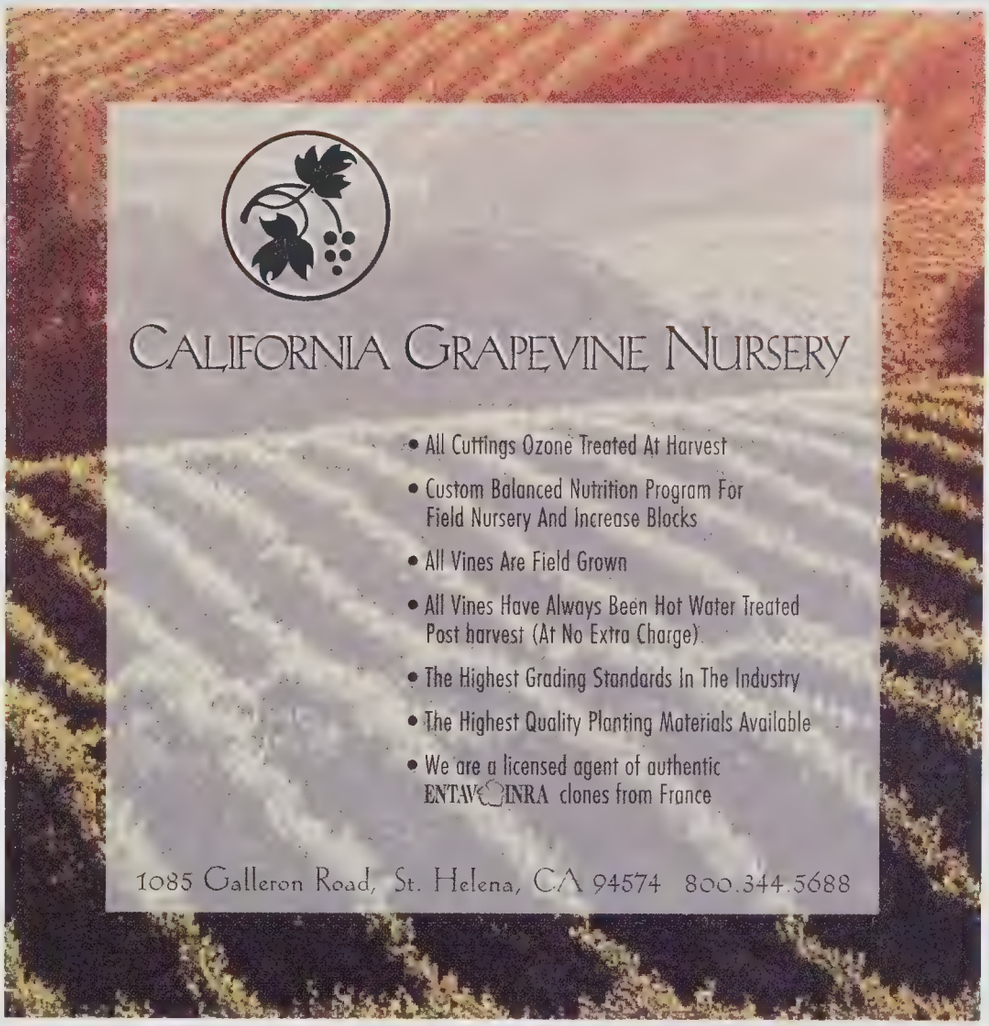
Red-brown leaf symptoms—may be a more advanced stage of the disorder.

Schultz also noted that, for Syrah under severe drought conditions, there was a very fine line between adequate production and death of a vine. A practical message from Schultz's work is that Syrah's drought response is efficient when water stress remains below some maximum threshold, but as water stress exceeds this, the limited stomatal response and progressively lower leaf-water potential may make the variety more prone to vascular failure (cavitation), ultimately causing a cessation in the xylem sap flow.

T. Winkel and S. Rambal conducted similar research on the varieties Carignane, Merlot, and Syrah in France.[15] They also found that the Syrah exhibited relatively little stomatal response to drought. They further noted that Syrah protected its vascular integrity by reducing the total transpiring surface via a reduction in leaf area.

In earlier work, Winkel and Rambal determined that Carignane had a much greater stomatal sensitivity to changes in air humidity as compared to Syrah, which they attributed to the different evolutionary origins of the two varieties.[16] They concluded that this difference in behavior reflected the recognized poorer drought adaptability of Syrah.

The degree of water stress experienced by Syrah in different parts of the world can be evaluated by comparing pressure chamber readings of midday leaf-water potential from some published research trials in other regions with values reported by Central Coast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growers. Both Schulz in France and Ginestar in Australia reported maximum midday leaf pressure chamber readings of approximately 18 bars for their "dry" irrigation research treatments.[4]

By comparison, several Central Coast growers have reported midday readings of 21 or 22 bars in their vineyards. Research by C.G. Dundon and R.E. Smart in Australia measured values of up to 23 bars prior to harvest in a dry-farmed Shiraz vineyard. According to the authors, "extraordinary levels of stress were experienced by the vines" at this site, which led to a substantial amount of leaf necrosis.[2]

Poor training of young vines can result in constriction of the trunk, which will ultimately cause red leaf symptoms and stunting.

Based on the above research, the drought-response mechanism of Syrah appears to make it prone to xylem cavitation and/or leaf-area reduction when under excessive drought conditions. Such a response could then manifest itself as the symptoms that we associate with Syrah Disorder on the Central Coast.

Growers have commented that the onset of symptoms often occurs very rapidly, with entire vines becoming severely affected within just one or two days. This type of response is consistent with a significant and rapid change in vascular function, particularly at some location lower on the trunk.

Interestingly, research by ENTAV in France has shown that Syrah tends to form fewer vascular connections between the rootstock and scion after grafting as compared to Cabernet Sauvignon and Grenache.[6] If this trait remains as vines mature, it could predispose the variety to vascular failure when under severe stress.

Growers have also noted that individual vines that are affected in one season may not show symptoms the following season, and vice-versa; thus vines can recover from the disorder, which would also be expected with a transient vascular failure.

From a practical irrigation management perspective, the anisohydric drought response of Syrah effectively masks the degree of water stress experienced by the vines. By lowering its

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leaf-water potential while keeping its stomata open, Syrah maintains relatively strong leaf turgor pressure and continues to transpire large amounts of water, which keeps the leaves cool and the photosynthesis rate high.

The resulting firm, cool leaves and continual growth suggest to growers conducting visual and tactile inspections that the vines are not under significant stress, when in fact just the opposite may be true. Additionally, with its open stomata, Syrah will be transpiring relatively more water than other varieties under drought conditions, effectively removing more water from the soil and ultimately worsening its own condition.

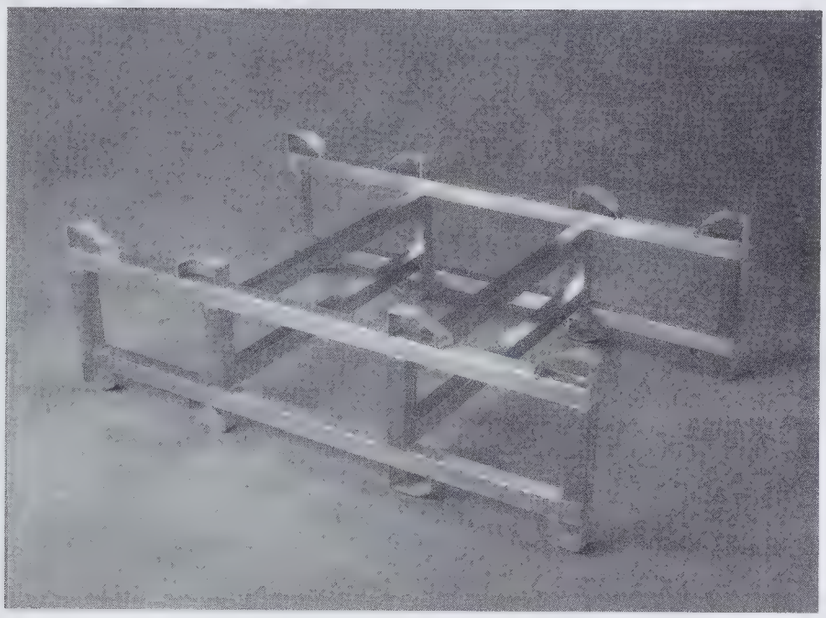
The demonstrated varietal susceptibility to severe drought, recent dry winters, reduced irrigation amounts, marginal irrigation water quality, and the intrinsic climate of the inland areas of the Central Coast, in part, may explain why we have seen an increasing incidence of Syrah Disorder in this area in recent years.

However, the fact that many of the recently affected vineyards have, in the past, produced high quality grapes without showing any disorder-symptoms suggests that this is a transient and correctable phenomenon. Growers with susceptible plantings should consider paying extra attention to irrigation and salinity management practices to avoid severe vine-water stress, and ideally monitor vine-water status throughout the season with a pressure chamber.

While other as-yet unknown causal factors may be involved in this disorder, the pattern of occurrence on the Central Coast suggests that excessive vine water stress is a primary factor in its ultimate expression.

Future plans

Our 2002–03 Syrah virus survey did not find Syrah vineyards with symptoms that matched the French Syrah Decline symptoms. In general, the majority of Syrah plantings are relatively virus-free compared to varieties, such as Cabernet Sauvignon,



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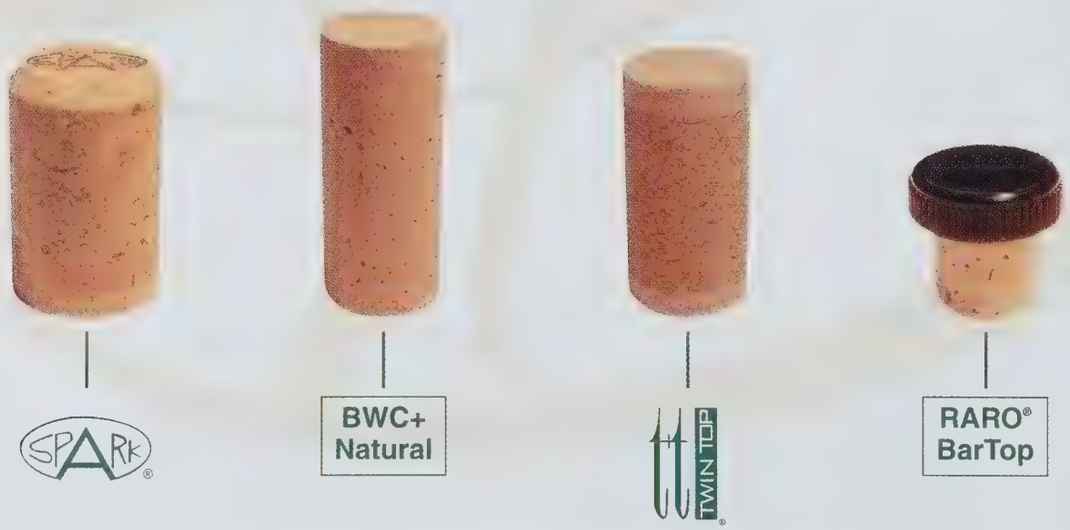

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Chardonnay, and Zinfandel, all of which have been established in California longer.

Over 1,500 PCR tests were completed on 131 samples from 77 surveyed vineyards. Approximately 95% of the samples tested negative for viruses typically associated with graft union disorders. Virus testing results were very similar statewide, which would be expected since the same clones and selections are available to all of California's growers, and viruses usually move with propagating materials.

The majority of problem sites could be explained by vineyard site or management issues. At this writing, Syrah growers should be relieved to know that if Syrah Decline exists in California, it is very rare.

Authors Golino and Rowhani had the opportunity to visit French vineyards with Syrah Decline. The French cases did not resemble cases in California. The swelling at the graft union of vines with the French Syrah Decline syndrome is solid and woody — something which has not been seen in samples of Syrah submitted to us from California.

We continue to take an interest in the cause of the French Decline problems. We are collaborating with Dr. Jean-Michele Boursiquot, ENTAV, France, and his colleagues to investigate the possibility that an unknown virus is causing French Syrah Decline.

Because we are not convinced that authentic Syrah Decline has been found in California, we plan additional work with samples from France that are frequently identified to demonstrate Syrah Decline. Both French samples and California field samples will be used for dsRNA extraction and cloning in hopes of identifying a causal agent of Syrah Decline.

Extracted dsRNAs can be virus-specific and are often used to find new viruses in plants, including grapes.[11] If a dsRNA can be associated with Syrah Decline, it can be used to create a cDNA library, which can be used both in detecting the agent of disease (by developing reliable PCR primers) and in characterizing its genome.

Grafting experiments are ongoing to try to recreate the symptoms of Syrah Decline. We have established a small field trial with symptomatic Syrah grafted onto select rootstocks to attempt to induce observed symptoms.

Most critical in our opinion, new work needs to be initiated on the Central Coast to determine the cause of the widespread and economically significant Syrah Disorder. Water-relations research noted earlier provides a solid direction to pursue in the 2004 season.

A proposal has been submitted to conduct a thorough investigation into the water relations of Central Coast Syrah across a range of irrigation levels, to determine if the disorder symptoms are, in fact, correlated with increasing water stress.

Plantings of Syrah along with Cabernet Sauvignon as a comparison variety will be

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monitored periodically for leaf- and stem-water potential, stomatal conductance, and leaf chlorophyll content. Vines will also be monitored continually for trunk sap flow, leaf temperature, and soil moisture.

A primary goal of new research will be to find a measurable vine parameter that can be used practically to predict if and when the vines are approaching the onset of the disorder.

Acknowledgements

The California survey was made possible with funding from the American Vineyard Foundation and the California Competitive Grant Program in Viticulture and Enology. We would like to acknowledge the invaluable help of Sue Sim, Mirtes Lima, and Raed Alkowni in our survey work and laboratory testing.

Many growers on the Central Coast have shared their individual experiences, theories, and valuable time in helping us evaluate Syrah Disorder, and a group of proactive Central Coast growers has pledged additional funding to the American Vineyard Foundation specifically to address this issue. Our thanks to all for giving us the help and resources needed to effectively address this emerging issue. ■

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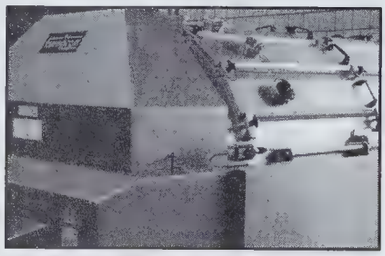

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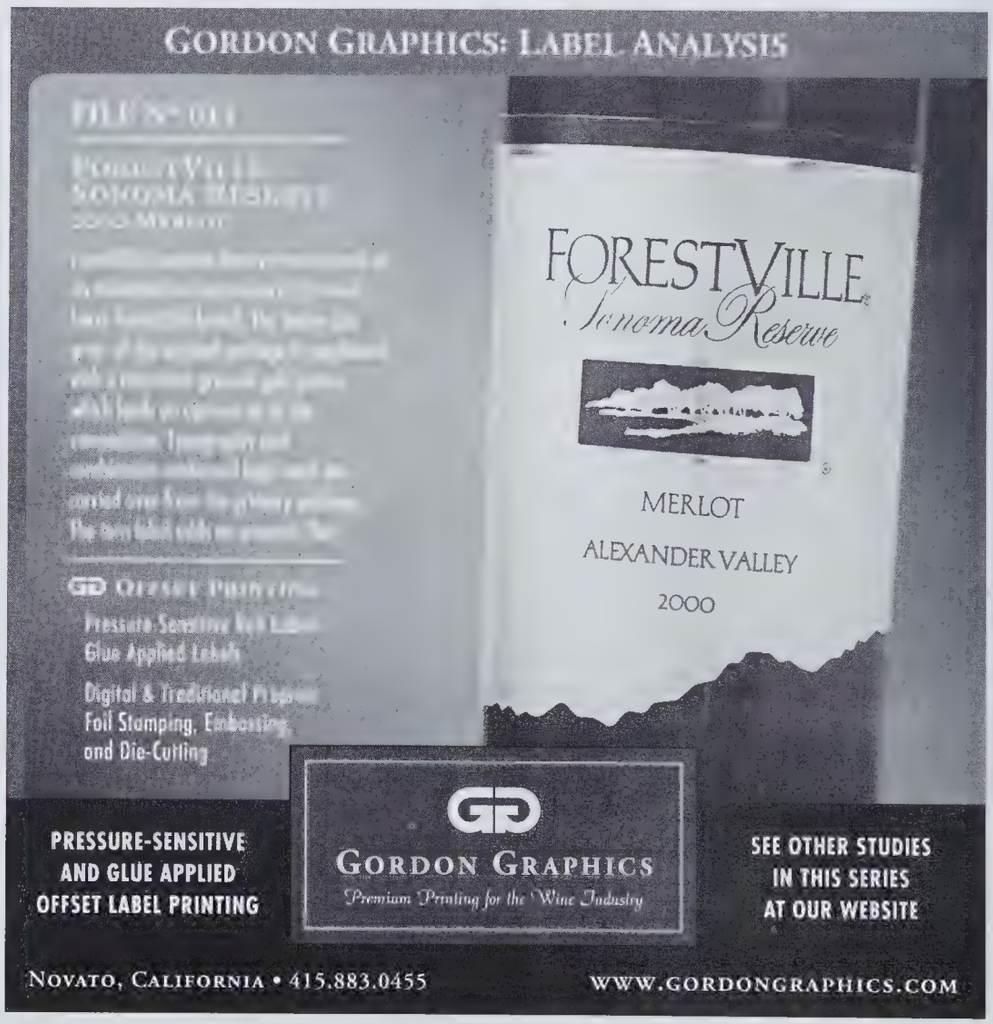

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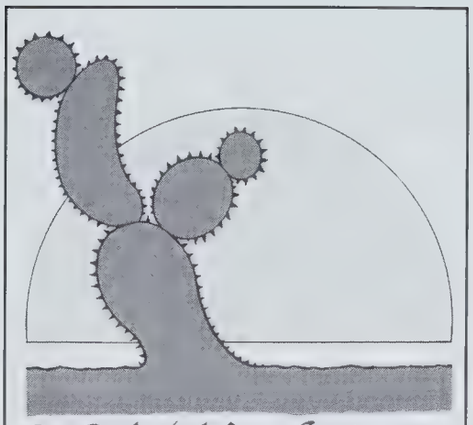

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WOLFF VINEYARDS

Making sense of modern grape farming

BY Eleanor & Ray Heald
Contributing Editors

"Farmers are victims of their own practices, good or bad, passed on from generation to generation. Today, farmers are turning the corner in some areas, and in winegrowing practices, they are on the leading edge," observes Jean-Pierre Wolff, Ph.D., owner of Wolff Vineyards.

Located on 125 acres near San Luis Obispo, CA, in the Edna Valley, Wolff Vineyards practices ecologically friendly agriculture. With research skills honed in the electrical testing industry, Jean-Pierre Wolff draws on what he considers practical and doable from three modern grape-farming methodologies: sustainable, organic, and biodynamic. Wolff is a board member of the Central Coast Wine Growers Association and member of the Central Coast Vineyard Team.

Planted 30 years ago by winegrowing pioneer Andy MacGregor, Wolff Vineyards was renamed in 1999 when Jean-Pierre and his wife Elke expanded the existing vineyard and added a small, artisan winery.

The vineyard includes approximately 55 acres of Chardonnay and 37 acres of Pinot Noir. Twelve acres are planted to a mix of Teroldego, Syrah, and Petite Sirah. Although the vineyard is managed by Pacific Vineyard Management Co., Wolff also makes his own personal contributions to the farming.

Some Chardonnay vines are 30 years old, producing a wine with a site-specific characteristic. Recently planted Pinot Noir includes four Dijon clones 777, 667, 115, and 04 (Pommard).

These clones are grafted to two different rootstocks, Riperia Gloire and 101-14. The less vigorous Riperia Gloire is planted on gravelly sandy clay loam, and 101-14, a more drought-resistant rootstock, is planted on Los Diablo complex.

"The old Chardonnay vines yield an average of 3.5 tons per acre on 8 x 12 spacing," reports Wolff. "New planting yields are consistent from young vines. Overall, the aim is to focus on quality first, then on quantity, where yields are consistent with ultra-premium low-yield crops."

Farming outside the box

"A whole-farm approach probably describes best the various farming techniques we are using," Wolff explains. "At the risk of sounding overly simplistic, there is no silver bullet solution to the complex subject of winegrape farming."

Wolff embraces the California Certified Organic Farming (CCOF) concept, but within limits. It's a very strict program that requires 100% verifiability of not using herbicides and pesticides in the vineyard with the exception of certified organic alternative products.

Because of restricted product residuals remaining in the vineyard, under most of the global certifications, it takes about five years to phase into complete organic compliance. All products used as soil amendments must be certified organic products.

Winemaking methods must also be 100% organic, which means no sulfur compounds can be added. However, the Alcohol and Tobacco Tax and Trade Bureau (TTB) label ruling does not allow a label claim of "contains no sulfites" because yeasts create sulfur compounds as a natural process during fermentation.

"I have done blind tasting of wines with and without SO_2 and found that the SO_2 acts as a flavor brightener in the wine," Wolff maintains. "Without SO_2 the wine is like bread without salt — a little dull.

"My vineyard practices are close to being organic, but I am not certified and do not plan to become certified, because I have seen other growers use the certification more as a marketing tool, rather than embracing the entire principle of organic farming."

Wolff also believes that there must be an understanding of the limitations of organic farming. As an example, he notes, in the Edna Valley due to its cool climate, there is often extreme mildew pressure and pest pressure from the obscure mealybug (not to be confused with the vine mealybug) and Argentinean ants.

In this geographic area, organic farming becomes very challenging, although in coming years, the advent of new certified organic products and techniques will assist persistent growers.

In drier and warmer growing areas, there is less mildew pressure and fewer problems with associated pests. "In those areas," Wolff contends, "it's easier to comply with the rules of certified organic farming."

Wolff cites the new ISO-14000 series, designed for environmental and ecological programs. "It is another cookie-cutter approach. It's a system of rules and regulations that must be obeyed. The problem is that it, too, does not allow one to think outside the box."

Jean-Pierre Wolff photos by Ray Heald

Sustainable concepts

In its broadest sense, sustainable farming implies that, as a good steward, one needs to sustain the land for future generations without depleting its natural resources. The concept of sustainability suggests that practices will be used to maintain the integrity of the land, allowing it to be farmed in the future.

"Sustainable must also include economic sustainability," Wolff adds. "It's obvious that, if one cannot make a living as a farmer on the land, then it is not sustainable. In a pure sense, the concept of sustainable means holistic farming that encompasses soil, water, and air, therefore including the environment, but also embracing the social and economic system.

For example, implementing good neighbor practices, such as dust and noise control, is becoming increasingly important in sprawling communities.

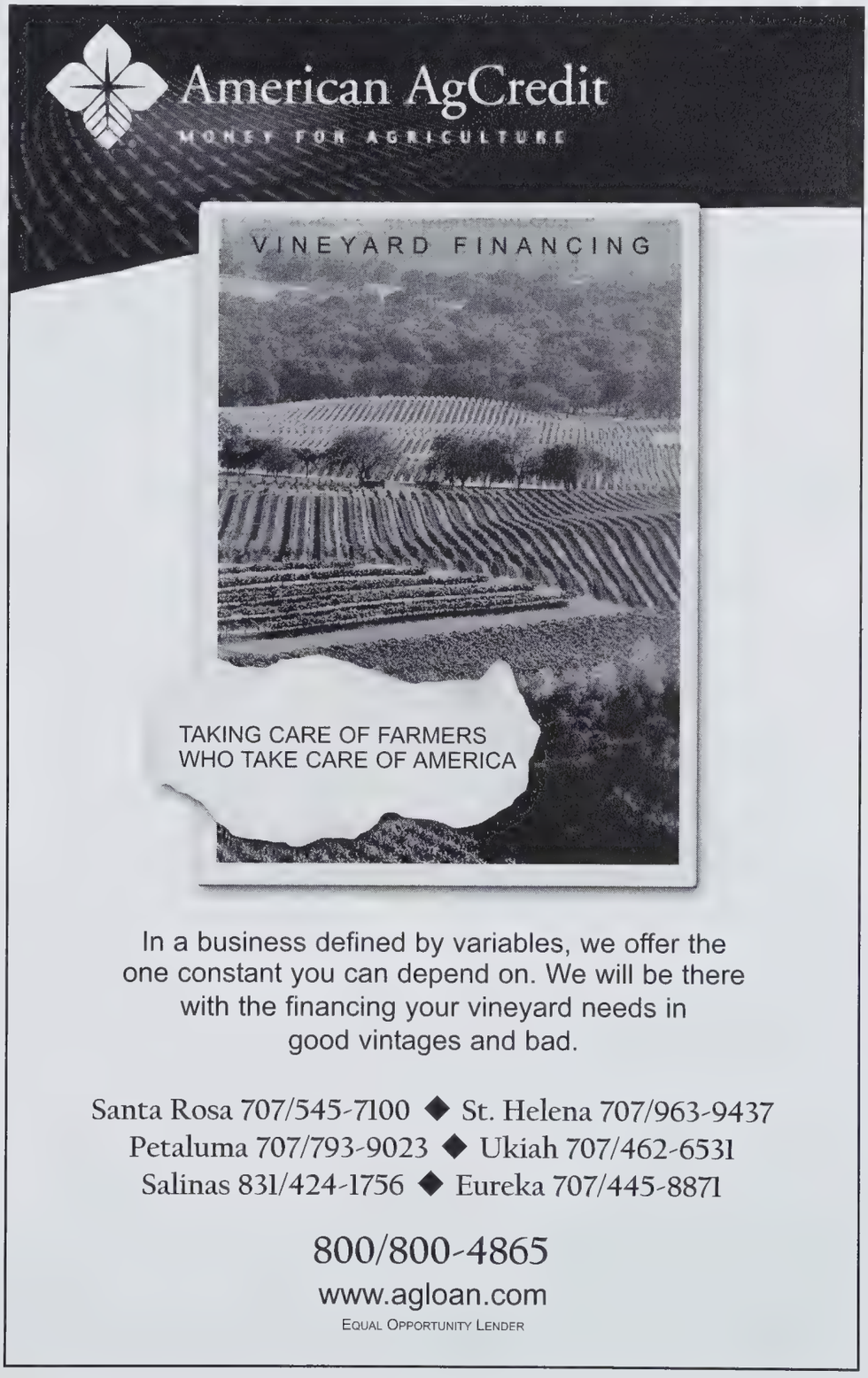
"On that account, in my vineyard, I call my approach ecologically friendly. Ecologically friendly uses the sound principles of organic farming that can be applied in a given growing region and those sustainable farming practices that do not deplete the soil, do not contaminate water, and do not put undesirable compounds into the air. It also includes a heavy dose of rehabilitation if needed."

Wolff views biodynamic farming as a subset of sustainable farming. A close subset is biologically integrated farming systems (BIFS), which attempt to find natural substitutes for chemical herbicides and pesticides.

"A good example of biodynamic farming is the use of beneficial insects. If a vineyard has obscure mealybug pressure, a release of stingless wasps can be beneficial. Wasps lay their larvae on the egg masses of the mealybug. The larvae consume the eggs and reduce the mealybug population."

At Wolff Vineyards, such a project is underway, but at an early research stage, and Wolff considers it premature to publish definitive results.

"I personally view beneficial insects as part of biodynamic farming," Wolff continues. "After all, the word 'bio' is not exclusive to full moons and crystals."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Pest pressures

On the subject of insecticides, Wolff notes that a new generation of targeted soft pesticides with a short re-entry period post-application is being developed. He notes that traditionally, if an infestation of vine mealybug or sharpshooter occurs, growers will usually hit the vine with all they have available (nuke it)!

This should be the last resort under a critical infestation, Wolff believes, and that the middle of the road for less threatening insect pressure is to use selective/targeted products, which will not kill all of the beneficials but will reduce the insect pressure to a level where the beneficials can take over and do the job thereafter.

Survival of beneficials in the Edna Valley and elsewhere requires judicious/minimum use of pesticides, cover crops with alternate row disking, biodiversity of grasses, and flowers in the vineyard.

Argentinean ants are a Wolff Vineyard problem because they nurse the obscure mealybug in order to feed on the honeydew excreted by the mealybug. Ladybugs were experimented with to help control the obscure mealybug but that effort failed.

"The problem encountered with ladybugs," Wolff explains, "can be attributed to the species of mealybug present, timing of the release (early morning versus afternoon), season, and the success can also be impacted by altitude."

"If some efforts do not fail, the farmer is not trying hard enough," Wolff asserts. "If every experimental effort is a success, then the farmer is not thinking outside the box. Research must be at the bleeding edge rather than the leading edge. Controlling an ant population that is acting as a vector will increase the parasitic wasp's ability to 'manage' the mealybug population."

Continuing in efforts to control the Argentinean ants, Wolff is cooperating with the University of California, Berkeley, to test a water solution of a chemical compound similar to that found in pet flea collars. The initial trial was made with thiomethoxam. To avoid the long EPA approval process for winegrape application, imidacloprid has been substituted. It has been diluted to 0.0001% active ingredient and mixed with a 25% sugar solution to create a high Brix solution before veraison.

The sugar concentration approximates the sweetness of the obscure mealybug honeydew. In the vineyard, the ant feeds on the solution via an inverted baby bottle fitted with a sponge. So far, Wolff has had good results controlling the ant population using this method. Upon completion of the project, the primary researchers will release results.

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Team's BIFS Project funded by the University of California Sustainable Agriculture Research and Education Program, project staff monitors the vineyard regularly throughout the growing season. Information on pest and disease pressure severity is recorded and reported to Wolff Vineyards to facilitate timely management decisions. Information is also collected on management practices and other inputs to the vineyard.

In one BIFS-designated block, Wolff Vineyards is experimenting with various reduced-risk materials and testing different timings for controlling the mealybug. The goal is that, through more timely and specific monitoring data, materials can be applied more effectively, thereby reducing mealybug populations over time.

Eventually, Wolff Vineyards hopes to reduce chemicals applied for mealybug control and provide conditions favorable to supporting parasitic wasps, which can be effective in reducing mealybug populations.

Insectary plans

"One difficulty with beneficial insect release," Wolff explains, "is that it's difficult to propagate insects in the lab. Therefore, I am establishing an active insectary along the perimeter of several blocks and at the center of the vineyard to rear living insects."

The insectary will be eight feet wide, planted within a 12-foot wide tractor-row. In addition to perimeter blocks, an additional insectary will be planted every 20 tractor rows. A native California wildflower mix, including *Phacelia campanularia, Eschscholzia californica, Linum lewsii, Lupinus succulentus, Linum rubrum,* and *Achillea millefolium,* will be seeded at a rate of 16 pounds per acre at a cost of $90 per acre. The soil will be pre-disked to reduce weed competition.

Wolff is eager to rear *P. Flavidulus,* the parasite that is effective against the obscure mealybug. Wolff also hopes to encourage other beneficials.

"Working with an entomologist under a USDA pilot program, I'll reintroduce the California native bee. The population of the California native bee (mason bee) has been reduced dramatically in recent years because of past pesticide use.

"These bees are 200 times more effective in pollination than the honey bee and are stingless. This re-introduction reinforces the idea of biodiversity and will assist natural cover crop re-seeding in future years."

Biodiversity

Wolff views biodiversity as part of ecologically friendly farming. Greater diversity built into a vineyard provides stability to the system.

"There are times," Wolff continues, "when the line is blurry as to whether you call it biodynamic or sustainable.

Soil Fertility for Grapes

Question: Is it possible to increase drought resistance for grapes grown on my land while also increasing soil fertility?

Answer: Yes it is. There are several possibilities that could help contribute to drought resistance for grapes.

For example, increasing the soil's ability to capture and retain water by incorporating compost or plant residues can help. Such practices serve to build organic matter levels in the soil and increase moisture holding content as it also helps to maintain or increase certain soil nutrient levels.

It is well recognized and emphasized in course materials on soil fertility that adequate amounts of **potassium** and **phosphate** increase water use efficiency for plant growth. Where needed both P and K can be supplied by incorporating organic materials that contain significant amounts and/or by adding the required amounts of a suitable fertilizer. Although there are still soils that lack a sufficient amount of one or both of these major elements, most relatively productive soils have sufficient levels to accomplish water use efficiency in that way. If such is not the case, applying correct amounts of the needed elements, based on a detailed soil analysis would be the most efficient way to increase water use for grapes as well as any other crops being grown on that land.

Roots located in the aerobic zone (the top 6–7 inches), are most effective at taking up nutrients. **Sulfur** significantly contributes to root growth of plants. Increases of as much as 50% in terms of extra growth of new roots have been reported when adequate **sulfur** is applied. To the extent that the root system is expanded, the efficiency of the crop to find and utilize soil moisture will also increase. Far too many vineyard soils are low to deficient in **sulfur**, and thus lacking when it comes to enough for optimum root growth.

The proper amount of **sulfur** to recommend should only be based on the results of a complete soil analysis. Some soils already have adequate amounts, some have far too much, but the majority are lacking, based on determined needs of a particular soil. Furthermore, in far too many cases, where the soil would respond well to **sulfur**, not nearly enough is recommended. However, just adding sufficient **sulfur** does not always work. The maximum response from **sulfur** can only be expected in each vineyard soil when **calcium** is also present in sufficient amounts, which is generally the next most important nutrient for water use. Just maintaining an acceptable pH range does not assure that a soil has sufficient calcium to accomplish optimum benefits. This will be given further attention as a part of this series on fertility for grapes in subsequent issues of ***PWV***.

Once the **phosphate**, **potassium** and **sulfur** are supplied, then consider the secondary elements, **calcium** and **magnesium**, to help with drought resistance. When the needed amounts of these major and secondary elements are not present, plants will lack in their ability to develop. This restricts the ability to take up optimum amounts of water. Any of these situations, left unresolved, results in less water use efficiency. The benefits of **calcium** and **magnesium** for water use efficiency are important and still to be considered, but keep in mind, if any of the elements discussed above are missing in the vineyard they generally take precedence over **calcium**, **magnesium** or any trace elements.

If you feel this could be an important factor for your soils, and they may not pass the test, we welcome the opportunity to help assure that they will.

Answers provided by Neal Kinsey, owner and author of *Neal Kinsey's Hands-On Agronomy*. We specialize in soil fertility consultations.

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As an example, about 1.5 tons/acre of dairy farm manure compost is applied, which can be enhanced with trace amounts of elements that, based on petiole analysis, the vines need.

"When using manure, it is important that it has been heat-treated to neutralize any residual antibiotics or hormones. The dairy farm manure is composted and purchased from processors who often mix winery pomace into the compost. The manure is banded into the soil at two feet from either side of the vine, applied immediately after harvest prior to the fall rains. Cost of manure compost is about $22/ton delivered.

"I am concerned about salt. Annual soil analysis helps forewarn of potential problems. An effective solution when low precipitation occurs in a given year is to flush the soil in the spring, by applying a deep watering cycle of 16 hours or more. The lower elevation, flat area of our vineyard is also surrounded by levees, created by elevated roads, which act as holding ponds drained by a system of culverts. This approach maximizes the collection of rainwater to saturate the ground. Our annual rainfall averages 22 inches."

As another tool in the grower's toolbox, Wolff does annual petiole analysis at 80% bloom when the clusters are forming. Analysis provides clues about trace mineral deficiency and, very important, nitrogen and potassium needs. Benchmark comparison of the data from year to year requires sampling of the same block and ideally the same vine.

If the vine needs iron or zinc, trace amounts can be mixed with the manure. Winter rains leach nutrients and trace elements from the manure down to the vine roots. This method is used selectively where the vines need a boost. Some blocks do not require additional trace elements. Supplemental irrigation can also be used if early rainfalls don't occur.

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Gypsum and limestone are also added at 3 and 1 tons/acre respectively, throughout the vineyard. The delivered cost of gypsum is about $22/ton and limestone is $35/ton. Gypsum and lime help adjust soil pH when necessary, improve water percolation into heavy soil, and help the vines metabolize trace elements and nutrients. In magnesium-rich soils, addition of calcium displaces excess magnesium.

Manure also significantly increases microorganisms in the soil. Over time and with multiple applications, the soil will become more open with less compaction. The combination of manure application and green manure, produced from a cover crop, will convert an otherwise sterile soil into a soil rich with microorganisms and teaming with life.

"I know this," Wolff contends, "because I have looked at the soil with a loupe and viewed microscope slides from previous studies performed on the subject. Modern farming methods — whether they are called sustainable, organic, or biodynamic — force the farmer to go into the vineyard and pay attention to what's going on."

Some techniques, like composting, are not economical for small vineyard operations, notes Wolff. Economies of scale must be considered. It may be economical for a 500-acre vineyard to compost. But with only about 100 planted acres, Wolff considers it smarter to purchase compost. Pomace from Wolff's winery is spread over the vineyard and disked in prior to gypsum, lime, and manure application, and cover crop seeding.

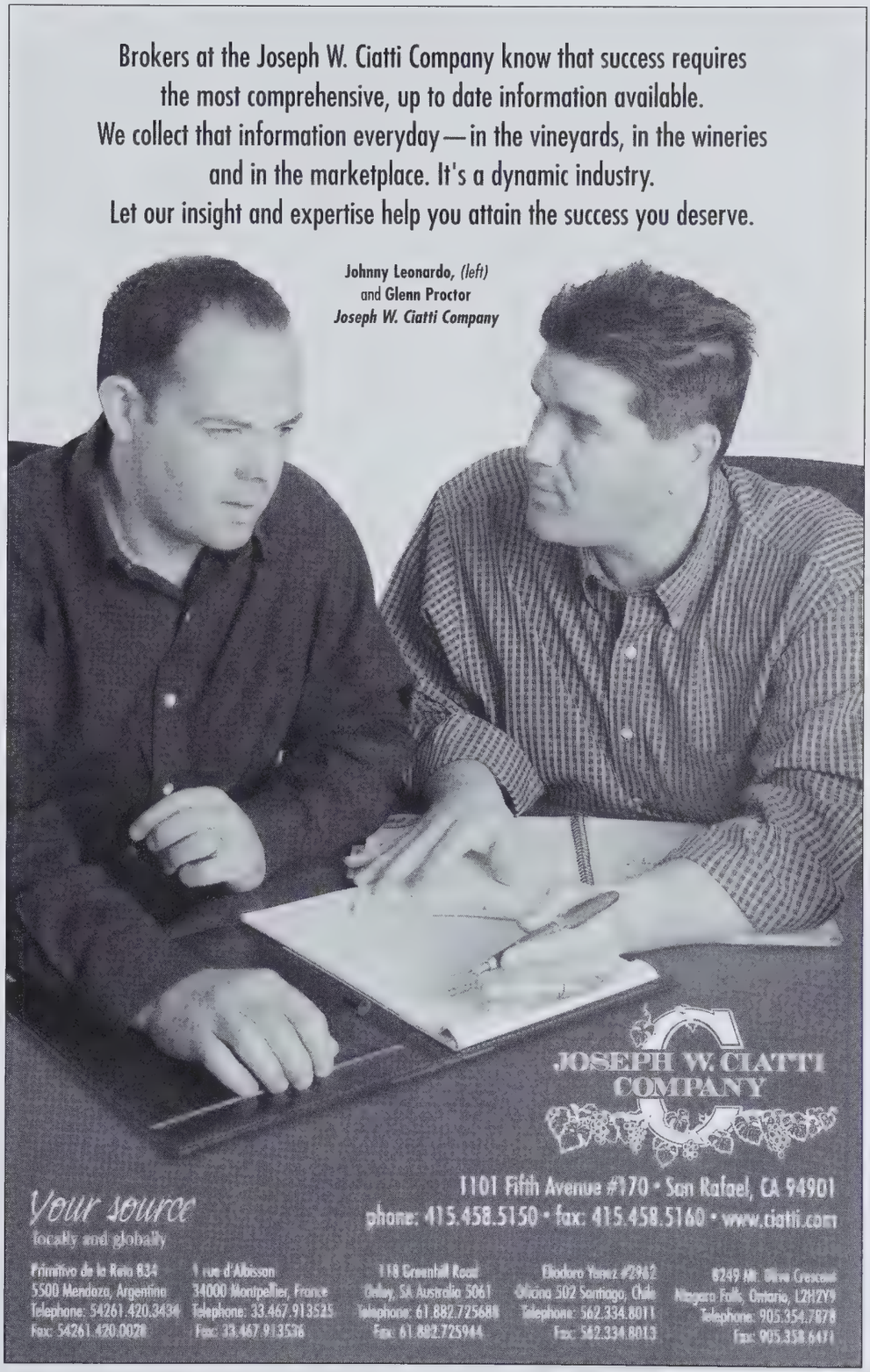
"Sometimes you have to leave it up to those with expertise," Wolff acknowledges. "I do not bury a sheep's horn filled with manure, hang crystals at end posts, or time any viticultural methods by a phase of the moon. Biodynamic, to me, is a scientific method, not something that is just warm and fuzzy.

"We focus on the why, when, and how, instead of spraying for powdery mildew on Tuesday because it is on the calendar. We use data from vineyard weather stations and from monitoring information, or use the mildew pressure equation to calculate the mildew spore pressure. This optimizes a spray program.

"By making calculations, it is often possible to eliminate one spray application per year. I consider that being ahead both economically and ecologically."

Water management and conservation

Wolff considers both water management and conservation essential elements of sustainable farming. In 2001, he cooperated in a University of California Cooperative Extension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Soil moisture sensors have been placed at various depths throughout the vineyard. They are effective in determining whether or not to irrigate. Wolff takes the data from the sensors and e-mails it to George Donati, vineyard operations manager of Pacific Vineyard Co. (San Luis Obispo, CA), who then decides from the data whether or not to irrigate. Additional sensors are monitored directly by the Pacific Vineyard Co.

"In our irrigation system, we have saved a lot of money with a variable frequency water pump," explains Wolff. "We have also benefitted from an irrigation energy rebate program sponsored by the State of California Department of Energy, which returned 40% of the investment cost during the first year. (Program expired in 2003.)

"First, new pumps with high-efficiency, variable-frequency motors were installed and, second, an electronic control system has been added. Before, a 15 horsepower (hp) pump ran at 15 hp. It was either on or off. With electronic speed controls, the pump can operate from 1 to 15 hp. It can be slowed to match the amount of water or pressure required.

"A variable-frequency drive allows a pump to operate at various speeds, thus varying the operating horsepower, pressure, and flow rate. Although the maximum mechanical efficiency changes slightly, the pump is able to deliver a specific water-pressure requirement under various conditions.

"For example, watering five acres close to the pump location will require fewer gallons per minute and less electrical energy than watering 10 acres one mile away with an elevation of an additional 50 feet.

"By using a closed-loop water pressure sensor in the line, the pump can automatically adjust how much speed/horsepower is required to deliver the water quantity required at a given pressure. Pressure can also be adjusted to optimum efficiency.

"For example, with a pressure-compensated irrigation system (installed at Wolff Vineyards), emitters will deliver 0.48 gallon/hour accurately between 10 and 25 PSI.

"Under these parameters, the worse-case scenario can be adjusted to meet minimum and maximum pressure requirements at the end of the dripper-hose. All this translates to a very efficient system, utilizing the pump energy 'on demand.'"

In a vineyard where the water table level fluctuates significantly, as at Wolff Vineyards, being able to control the water flow is also very beneficial. Readers wishing more information on available energy efficiency programs

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Since the Wolff Vineyards' irrigation system is located along the entry road to the property, vineyard blocks are located at various distances from it. The digital system automatically adjusts appropriately depending on the distance, elevation, size of the block, and amount of water being delivered.

Total cost of the system was about $12,000 for the controls, which included installation. The annual energy bill for the currently planted acres is now about the same as it was when 55 original acres were irrigated poorly and unevenly.

Although 28 acres of 30-year-old vines in the lower elevations are now dry farmed, utilizing various water retention techniques discussed earlier, 68 acres are irrigated (including water-thirsty new plantings) for the same energy cost of the original 55 acres.

To determine irrigation efficiency, the Cachuma Resource Conservation District mobile efficiency lab is utilized. Inspection of the system found extremely good uniformity above 90%. The pressure-compensating emitters are fine-tuned with the variable-frequency drive. A separately controlled drip line serves the low and high elevation, sometimes within the same vine row, to benefit from water run-off from the higher elevation.

Other eco-friendly projects

"What is missing in the CCOF program," Wolff notes, "are such elements as the irrigation efficiency program or a fish habitat restoration program. With sustainable practices focused on being a good steward of the land, a farmer can include as many applications as economically viable. This is why the wine industry needs a label identification to recognize ecologically friendly, sustainable viticulture and winemaking."

Wolff points to increasing pressure to establish watershed programs and also issues of agricultural water runoff. In 2001, he introduced a steelhead habitat restoration program in West Corral de Piedra Creek, which discharges into Pismo Beach, four miles west. The creek runs east to west along the north side of Wolff Vineyards with a tributary on the south side, joining at Orcutt Road.

If he can re-establish a sustained population of steelhead (which do run but not every year) in the creek, Wolff believes it will be another indication of nature in balance.

Through a volunteer watershed committee in the Edna Valley Ameri-

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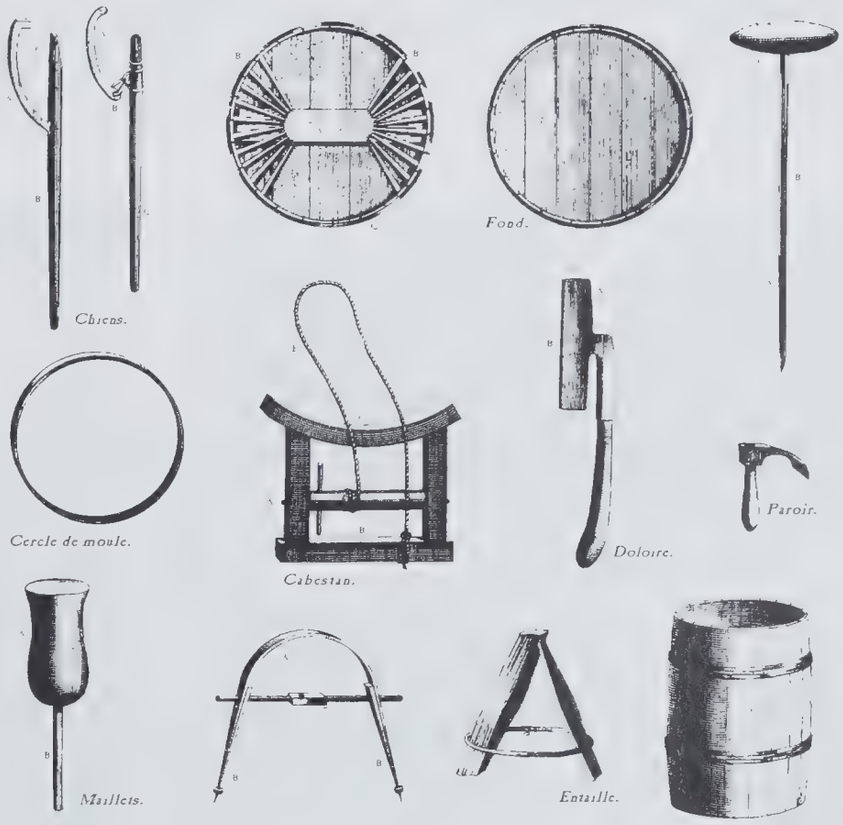

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can Viticultural Area, Wolff is promoting interest among neighbors and other area growers in working toward creek rehabilitation. By being pro-active, he hopes to avoid agencies dictating policies.

"By being proactive," Wolff contends, "grapegrowers have better cooperation and control over ecological issues."

Because Wolff has established cooperative relations with the Natural Resource & Conservation Service on an Environmental Quality Improvement Program for the creek, he is currently working on a grant with the California Department of Fish & Game, which has requested to use Wolff Vineyards as a demonstration site for creek habitat restoration. The project includes riparian rehabilitation, re-sloping, and creating an additional 10-foot buffer zone between vines and the creek.

The 10-foot buffer zone, in addition to the existing 16-foot space between the creek and vine rows, will be planted with native grass and shrubs. This additional space will reduce embankment erosion from vineyard water runoff and farm equipment traffic and will act as a flood plain for potential "25-year" storms.

"The old way of farming," Wolff explains, "meant that vineyards were planted as close to the creek as possible. When the tractor made a turn at the end of a row, it created erosion problems and was dangerous for the driver. Erosion control will reduce sediment deposits and thus improve ground water percolation to the aquifer. By adding a buffer zone — more grass and trees – shade and habitat are improved. Trees are now being replanted for shading and to create resting pools for the steelhead.

"I agreed to become a demonstration site, because it could inspire some of my neighbors or other growers."

In this project, Wolff is working through the California Department of Fish & Game and using the Central Coast Salmon Enhancement organization to manage the project. The California Conservation Corps (CCC) will do the field implementation.

Because Central Coast steelhead are covered under the endangered species act, Wolff is also working with the National Oceanic and Atmospheric Agency (NOAA), the federal umbrella agency that includes National Marine Fisheries Service.

Winged crop protection

Wolff Vineyard has few problems with dove, quail, and birds other than starlings, but starlings, a non-native bird with few enemies, are a problem. For starling abatement in the past,

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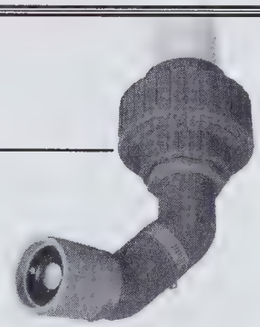

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Wolff used netting and bird-calling machines. Before and during the 2003 harvest, falconry was used to discourage starlings from destroying the crop.

During the harvest period, starling scouts go out in the morning to find a feeding place. Therefore, in the morning at Wolff Vineyards, a master falconer releases a falcon to discourage the starling scouts. Discouraged scouts, take the starlings flock to a different feeding ground.

Because starlings have a "short memory," the falconer may need to return every three to four hours during the day to keep starlings out of the vineyard.

One falcon can control 300 acres. Ordinary bird abatement costs about $62.50/acre per season for a vineyard (or contiguous vineyards of that size). Netting costs $280/acre and can last four years, averaging about $70/acre per season. Falconry costs about $63.50/acre per season for 300 acres; the cost for smaller vineyards would be higher.

Falconer Brad Felger, Air Strike Technology.

When managing 300 acres, falconry costs about the same as netting or bird abatement, but causes no distress to neighbors and is easier to do.

Wolff employs master falconer Brad Felger. His company is Air Strike Technology located in Atascadero, CA.

"A significant qualitative benefit of falconry is peace with your neighbors," Wolff emphasizes.

Economic sustainability

As Wolff declares, the final proof of the success of Wolff Vineyards' ecologically friendly farming must be in grape quality and vineyard economic sustainability.

Wolff Vineyards' old vines Chardonnay grapes have consistently produced award-winning wines. Ultra-premium wineries are purchasing Wolff's grapes because of the reputation and track record of the vineyard.

Grape prices achieved by Wolff Vineyards reflect ultra-premium, vineyard-designated grapes, demonstrating that Wolff's ecologically friendly farming is very successful indeed. ■

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DRY CREEK VALLEY ZINFANDEL

Producers opt for single-vineyard style

BY Eleanor & Ray Heald
Contributing Editors

Dry Creek Valley in California's Sonoma County is to Zinfandel as Burgundy is to Pinot Noir and Chardonnay, as Bordeaux is to Cabernet Sauvignon, and as the Northern Rhône Valley in France is to Syrah.

In Dry Creek Valley (DCV), Zinfandel has found the essential ingredients of soil, climate, exposure, and location to grant the grape full expression. Cementing the DCV's Zinfandel reputation is an ongoing challenge.

Recognizing this, DCV producers develop regional blends to transport Zinfandel to the world stage while producing single-vineyard Zinfandels to demonstrate the exciting elements of site specificity.

Winemaker Phyllis Zouzounis (Mazzocco Vineyards, Healdsburg, CA) believes that Zinfandel throughout Dry Creek Valley (DCV) has many different personalities. "However," she says, "single-vineyard wines, especially those from old vines, illustrate to the consumer differences in the wine due to climate, location, exposure, and soil composition.

"It's important that single-vineyard Zinfandels carry specific characteristics each year and establish a reputation for them."

Zouzounis also notes that a regional blend allows a winemaker to establish an individuality in the wine related to his/her own personality, while single vineyard wines, independent of location within the valley, should also indicate vintage differences.

"That's even more interesting," she maintains. "There should be a similarity throughout a vertical from that vineyard, with differences offering vintage uniqueness."

As a single-vineyard bottling, Mazzocco produces Cuneo & Saini Zinfandel from 90-year-old vines, located on eastern benchland along Dry Creek in central DCV.

PARTICIPATING PRODUCERS:

Phyllis Zouzounis, Winemaker
Duff Bevill, Vineyard Manager
Mazzocco Vineyards,
Healdsburg, CA

Grady Wann, Winemaker
Quivira Vineyards,
Healdsburg, CA

John Olney, Winemaker
David Gates, vice president, Vineyard Operations
Ridge Lytton Springs,
Healdsburg, CA

Kent Rosenblum, Proprietor
Jeff Cohn, Winemaker
Rosenblum Cellars,
Alameda, CA

Triple viewpoints

"It's the winemaker in us that drives us to make single-vineyard wines," winemaker Grady Wann (Quivira Vineyards, Healdsburg, CA) says. "A blend allows us to create a composite that has all the attributes defining a winery or winemaker style."

Even if he only bottled one Zinfandel in the end, Wann would make 40 during any given vintage because he harvests each section of four different ranches separately. He handles grapes from each section slightly differently in the winery, choosing different yeasts and a variety of barrel coopers.

"That's just what winemakers do," Wann emphasizes. "Part of the winemaking fun is allowing the consumer to see some of our work in a single-vineyard wine."

Specific vineyard fractions that most reflect the individuality of a particular vineyard in a given vintage are bottled as a vineyard designate. Wann says it helps to tell the story of DCV and Quivira's ranches better.

Wine Creek Ranch is Quivira's estate vineyard. With red clay soil, it's a typical western DCV hillside with eastern exposure. Planted in 1960, vines are head-trained, spur-pruned, and fairly low-yielding at 6 to 8 pounds per vine (PPV).

One corner of the vineyard is 80% Petite Sirah, and that adds a unique character to the wine — which tends to be quite dark, brooding, and tannic — along with black cherry and spicy elements that, over the years, have been key to Quivira's regional Zinfandel style.

Anderson Ranch (farmed by Quivira on a 30-year lease with owners Nadine and Ray Anderson) is the youngest of Quivira's Zinfandel sources. Planted in 1996 to pre-Prohibition clonal selections, the site is off Lytton Springs Road, west of the Healdsburg airport.

"These are young vines," Wann notes, "and we've been merciless with crop load, maintaining 5 to 6 PPV. Broad blackberry-like fruit is lush and soft — quite different from what we experience from western hillside vineyards.

"For winery visitors, the old vine heritage clones help to tell the story of Zinfandel both in DCV and throughout California."

Standley Ranch offers an excellent example. Owned by Lempe Standley and farmed by her son Tom, it is a 2-acre, steep western hillside vineyard in northern DCV. Vines planted pre-Prohibition (exact date unknown) grow, essentially, on a sheet of shale covered with some red dust.

Standley vines are classic old-vine Zinfandel, yielding 4 to 5 PPV. Without moisture reserve and left unmonitored, the vineyard has a tendency to crash about harvest time. Bright red fruit and low pH are the hallmarks. Yet, Wann says the vineyard can be "quirky" and as such is not kept separate every year.

Block picking

About 195 acres of Ridge Lytton Springs are divided into Lytton East

and Lytton West ranches. The majority of vines are Zinfandel, complemented by significant plantings of Petite Sirah, some Carignane, Grenache, and Mataro. The Syrah that has been planted is not used in the Zinfandel program.

The acreage is divided into 88 blocks according to soil types, and each is picked separately. Depending on block size, some blocks may be picked as many as three different times.

"Ridge became interested in Lytton Springs," vineyard manager David Gates notes, "when Paul Draper (Ridge CEO and winemaker) first saw the magical old vines in 1972.

"Today, the fun thing for me as a viticulturist is trying techniques to make younger vines behave like old ones, so that their wine quality is excellent enough to make it into the Lytton Springs Zinfandel bottling."

New frontier

Kent Rosenblum (Rosenblum Cellars, Alameda, CA) stresses that DCV is something of a misnomer. "More than half the grapes grown in DCV," he notes, "are grown between 800 and 1,200 feet elevation. These soils are less fertile. To grow there, vines must struggle. For that reason, hillside-grown Zinfandels are always the best."

On this account, Rosenblum added Rockpile Road, approved as a DCV sub-AVA in April 2002, to the many Zinfandels it bottles from regions throughout California.

"Until 12 years ago," Rosenblum continues, "Rockpile, most of which is steep hillside at 1,200 feet elevation, had very few vineyard plantings. Today, there are only 12 vineyards. We're bordering on a new frontier there."

Best DCV sites

Gates points to climate as the principal reason DCV is well-suited to Zinfandel. "Fog rolls in from the Russian River and makes its way north, up valley," he explains. "Then it

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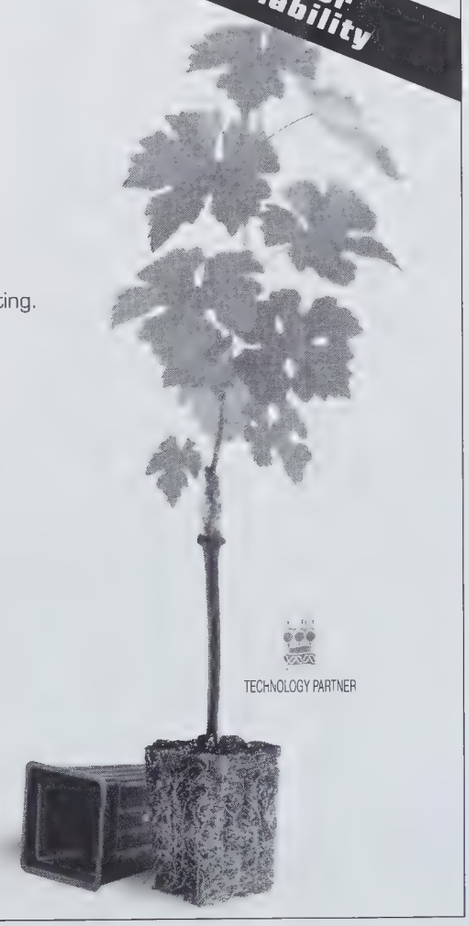

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recedes the opposite way so that northern regions have less fog than those in the south. Cool nights and cool mornings promote good acidity and good color in Zinfandel."

Second, Gates cites a good mixture of soil types with gravel throughout the profile. All the soil types have sufficient clay to hold water, so vines mature easily with minimal irrigation.

"What we've noticed at Lytton Springs," he reports, "is that we have six different soil types. In the top 3 to 5 feet of some blocks, there's high clay content, up to 50%. At that amount, the vineyard can be dry-farmed, but you can't expect much in the way of production or, in some years, quality because 50% is too much clay.

"The best soils have more gravel content. Then vines need the least manipulation. Also good are fairly deep clay-loam soils with equal percentages of loam and clay strewn with gravel.

"In these deeper soils, the water table is 3 to 4 feet deep in the spring. Then it recedes by May, and the roots chase the water down.

"Deeper soils stay warm, so the roots are growing and the vines are up and running by June. Those vines not only grow well but have good fruitfulness. They don't tend to crash late season, which is the problem with too much clay, which holds water that is unavailable to the roots, especially in August when they need it. There's a fine line between too much water and not enough."

Historically, Mazzocco vineyard manager Duff Bevill notes, there are several classic Zinfandel regions in the valley. Vineyards off Lytton Springs Road have some of the oldest vines, which have survived for all the reasons Gates mentions.

"A general observation," Bevill explains, "is that vines in this region are smaller, indicative of less fertile soils. When one observes an 80-year old Zinfandel vine that's 2.5 feet to 3 feet tall, it means that its annual growth is minimal. Cumulative measurement of size is an indication of soil fertility."

DCV eastern benchland soils have gravel mixed with higher iron content (red soils), which is another indication of a good location to grow Zinfandel.

"Like any steep hillside planting," Rosenblum adds, "Rockpile vines do not overproduce. Roots sink through rock and shale to pick up minerals. Once established, these vines can be dry farmed. Steep sites yield flavors from small berries that are more intensely berry-like and overall more interesting."

Winemaker John Olney (Ridge Lytton Springs, Healdsburg, CA) adds to the hillside discussion. "There's a water limitation on outlying hills around Lake Sonoma within Dry Creek Valley. A requirement of planting there is selection of drought-resistant rootstock, which should be well established before budding a scion to it."

Wann agrees but also believes that, in addition to the Lytton Springs area and eastern benchlands, the western hills of DCV are good Zinfandel vineyard locations. He suggests that Rockpile is the northern-most extension of the western hills.

"All of these locations are off the valley floor," Wann notes. "All have soil profiles very different from the valley floor. Not only is this historically significant, it's important from the standpoint of growing Zinfandel, because all the quality producers and single-vineyard designates are from off-valley-floor soils — even if they are not far off."

Historically, hillsides were relegated to vineyards because 100 years ago, the valley floor was best for row crops. The valley floor has only been used for grapegrowing recently.

Some of the eastern benchlands are not far off the valley floor, yet the soil profiles are less rich, a factor that promotes smaller vines and berries.

Aroma and flavors

According to Zouzounis, DCV Zinfandels, in general, have good

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structure, balanced acid and pH, and red berry flavors. She notes raspberry, black cherry, black raspberry, and some blackberry, but says they lean more to the side of red fruits.

Rosenblum believes that flavors depend on grape ripeness. Very ripe and bordering on over-ripe fruit yields blackberry and chocolate characteristics.

Olney believes Zouzounis' description is on target. " I don't know if we can get more specific," he contends. "Pigeonholing is no good. If we think about it, there are factors — like 20% Petite Sirah as a blending variety, contrasted with a 100% varietal Zinfandel — which alter aromas and flavors.

"One winemaker prefers to pick at 28° Brix and another at 25° Brix. Then there are exposures and soil differences impacting flavors."

Wann notes that Quivira's three vineyards in the western hillsides of DCV are very red fruit-oriented, while eastern bench vineyards generally showcase more black fruit characters.

Clonal selections

Budwood for the single vineyards under discussion came from the cleanest vines in older vineyards. At Mazzocco Vineyards, the Cuneo-Saini clonal selection represents vines of unknown origin that were on the property in 1909. These old head-pruned vines have been propagated throughout the property. Some 40-year-old vines are trained on a T-trellis.

Rockpile Road Vineyard was planted with St. Peter's Church Zinfandel clonal selection. The St. Peter's Catholic Church in Cloverdale owns a 115- to 120-year-old vineyard (a mix of Zinfandel and Carignane) and leases it to Jack Florence. Rosenblum has made Zinfandel from this vineyard since 1994.

When Florence planted Rockpile Road Vineyard, he selected the cleanest budwood from the church vineyard and propagated it.

Quivira's Anderson Ranch vines were grafted from a number of field selections, one carrying the label Mazzoni. Mazzoni Vineyard in Cloverdale has been a major source of DCV Zinfandel budwood for many years. Vines at Quivira's Wine Creek and Standley Ranches are described as "Dry Creek Heritage clone." Gates prefers to call Ridge Lytton Springs plantings a field selection. "Yet," he says, "one can argue that, 180 years ago, there were only one or two vines brought from Europe to the U.S. All the older Zinfandel plantings in California came from those vines. Over time, sports (mutations) and interactions of virus occurred that changed the vines."

Unfortunately, some Zinfandel vines around 60 years old exhibit significant virus. Vineyards older than 60 years are a lot cleaner than these "middle-aged" vines. Producers are sourcing from older vines and avoid the virused vines.

"Apparently," Bevill explains, "in the 1940s, the California Department. of Agriculture released St. George rootstock that was virus-contaminated. In turn, the virus-infected rootstock contaminated Zinfandel planted at that time. Pre-1940 plantings are favored as are pre-Prohibition blocks, since little was planted in the 1930s."

To correct the 1940s problem, the Foundation Plant Service (FPS) was established and cleaned up the major rootstock viruses with heat treatment.

"Virus is a controversial topic," Wann indicates, "but we know that we do not want to be propagating newer UCD plant material. So, we've attempted to find the cleanest vines that grow the best quality fruit. On certain sites, virus can be beneficial. If in fact, it does not harm the health of the vine, it may actually restrict crop size. Some viruses, however, are clearly bad."

Gates reports that there are seven or eight different forms of leaf roll virus. There's also fan leaf, stem pitting, corky bark, and others.

"Virus indexing is like chasing your tail," he says. "As more sensitive methods are developed, more viruses are identified. Some, such as leaf-roll, corky bark, and fan leaf manifest themselves totally in vines and should be avoided. Others are more benign. They can show up when a

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different rootstock is used. It's important to know the disease status of your vines."

Rootstocks

In higher clay-content soils, where St. George rootstock tends to crash, Ridge Lytton Springs began planting 110-R and 1103-P in 1991 when using pre-Prohibition budwood from sources other than Lytton Springs.

Ridge Lytton Springs sourced Santa Cruz Mountains Picchetti Ranch budwood and Heart's Desire selection, first planted in 1882 in Alexander Valley, and a selection from Mendocino County. All remain quite virus free.

Gates notes that 1103-P offers vines the same advantages as St. George (grows vigorously in the spring and slows down by veraison), except it does not crash. Rootstock 1103-P functions better to set looser Zinfandel bunches (an important factor in avoiding bunch rot) than more moderate rootstocks, such as 3309C, 420-A, and 101-14Mgt.

Lytton Springs continually fills in where old vines have died. Where replacement is done on specific blocks, Gates sets up drip irrigation with emitters on new vines only. Such space filling was done on hillside blocks of Lytton East Ranch in 1992. These vines are pruned differently than the old vines, and crop is dropped to aid growth. It took about 10 years to get the vines up to speed with older ones.

Viticulture adjustments

Bevill suggests that viticultural practices for an old, head-pruned and dry-farmed vineyard are quite different than for newer plantings on a vertical trellis in an irrigated vineyard.

Because it was the choice of the grower at Rockpile Road Vineyard, the fruit is grown on a bilateral cordon with a vertical trellis. "A trellis," Rosenblum maintains, "makes more sense economically and offers greater consistency.

"The land is used more effectively. With a cordon system, grapes are spread out better to receive the benefits of sunshine. There are fewer less ripe and raisined bunches on the same vine. With head-pruned vines, some bunches may be hidden and do not achieve physiological ripeness while, on the same vine, there are raisined bunches."

Rosenblum's winemaker Jeff Cohn adds, "On a cordon with a vertical trellis, we get better quality because of sun exposure and better airflow through the vines. We produce physiologically riper and richer fruit with better flavors."

Mazzocco Vineyard has both head-pruned and vertically trellised, cordon-pruned vines. "I believe that you can produce as good if not better grapes on a vertical trellis, that is cordon-pruned to two buds/spur," Zouzounis states in agreement. "But you do have to drop bunches because a cordon system tends to set a larger crop."

Bevill adds, "The component that's always missing in this discussion is that we do not have any 100-year-old vineyards that are cordon-pruned on a vertical trellis. The debate always revolves around cordon-pruned on a vertical trellis compared to head pruned.

"If we could compare vines of equal age, same rootstock, using equivalent irrigation practices or dry-farming, all things being equal — I cannot understand, intuitively and logically, why one would be inferior to the other. The good farmer takes care of vines using either training system. All things considered, with good farming techniques, top-notch fruit results from either one."

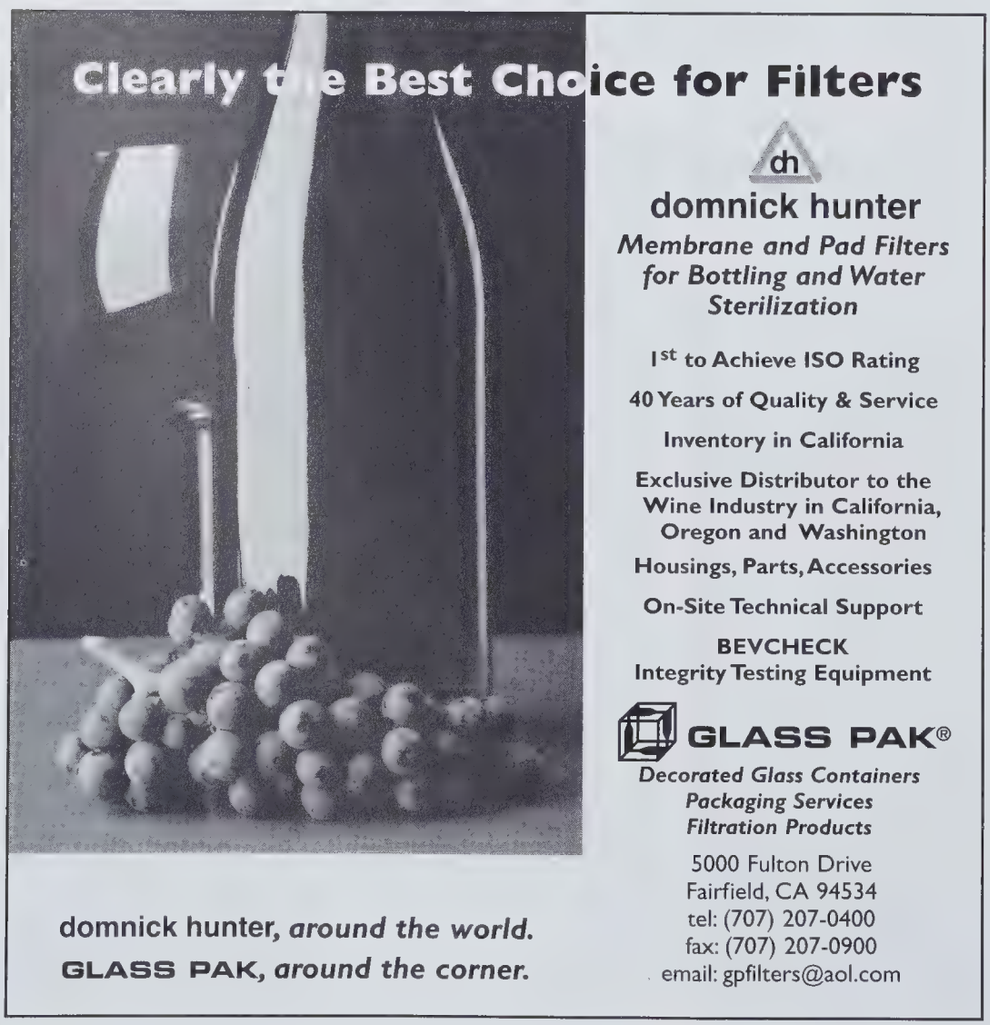
"A 100-year-old vine does not set the same kind of fruit as a young vine," Zouzounis adds. "If attention is paid to viticultural practices that promote excellent fruit, younger vines on a vertical trellis can produce top quality."

For 10-year-old and younger vineyards, Bevill automatically thins to a single cluster per shoot. To control rot and yields to 3.5 to 4 tons per acre (TPA), bunch shoulders are also removed.

Quivira's Zinfandel plantings are 95% head-trained, however, Wann continues to believe that, in problematic seasons, a cordon trellis may be more likely to deliver better fruit.

Defending old vines

Yet, Ridge winemaker Paul Draper contends that head-pruned vines pro-



duce superior fruit to cordon-pruned and trellised vines.

Gates defends Draper's position. "In the late 1980s and early 1990s, both head-pruned vines (8x10 spacing) and cordon-pruned on standard T-trellis (7x11 spacing) were compared at Ridge Lytton Springs.

"Vines were pruned to the same bud count, yet we always had 25% more crop on the cordon-pruned vines. The berries were also always larger. In the next experiment, we thinned to the same crop level and still the berry size on trellised vines was a little larger, which when we were fermenting, meant that we had reduced intensity.

"We are now repeating the experiment with VSP and thinning a little later in the season. The biggest problem that I see with head-trained vines is that there is no way to mechanize any practice. That may be a bigger problem in years to come."

When asked whether the outcomes would be different if the experiment were made with a VSP trellis, Gates replies, "I think differences are related to carbohydrate reserves and vine health. Inherently, a head-trained vine has fewer carbohydrates and reduced growth potential, which translates to smaller clusters.

"That being said, young Zinfandel produces big clusters with either growing method. Therefore, everything possible must be done to stress young vines as they are blooming and in the post-bloom period.

"Early season water stress controls berry size. Cordons have a lot of old wood and after harvest, the leaves are still manufacturing sugar that goes into the wood. That's what the vine lives on for the first three months of the next growing season. If you have more wood, you have more stored reserves, the result is bigger clusters and larger berries."

Uniformity

At Ridge Lytton Springs, Olney is less concerned about ripening variability, which he believes is part of Zinfandel's charm. "Less-ripe berries offer nuances in the wine that do not occur if you wait for every berry to achieve the same sugar content," he suggests.

Rosenblum adds that the pink berries, green berries, and raisined berries on a single Zinfandel cluster are past tense. "What we get from a good grower has neither pink nor green," he emphasizes.

"But we still use a sorting table to establish uniformity among bunches. The notion, that a Zinfandel cluster has green, pink, and well-colored berries is only true when farming techniques are poor or Mother Nature has had a bad weather year. Uniformity is a point of good farming."

Wann adds, "Yet we still experience a range of Brix among berries because even the best farming techniques can't totally eliminate raisined berries with Zinfandel. It's the nature of the beast."

Pre-fermentation maceration

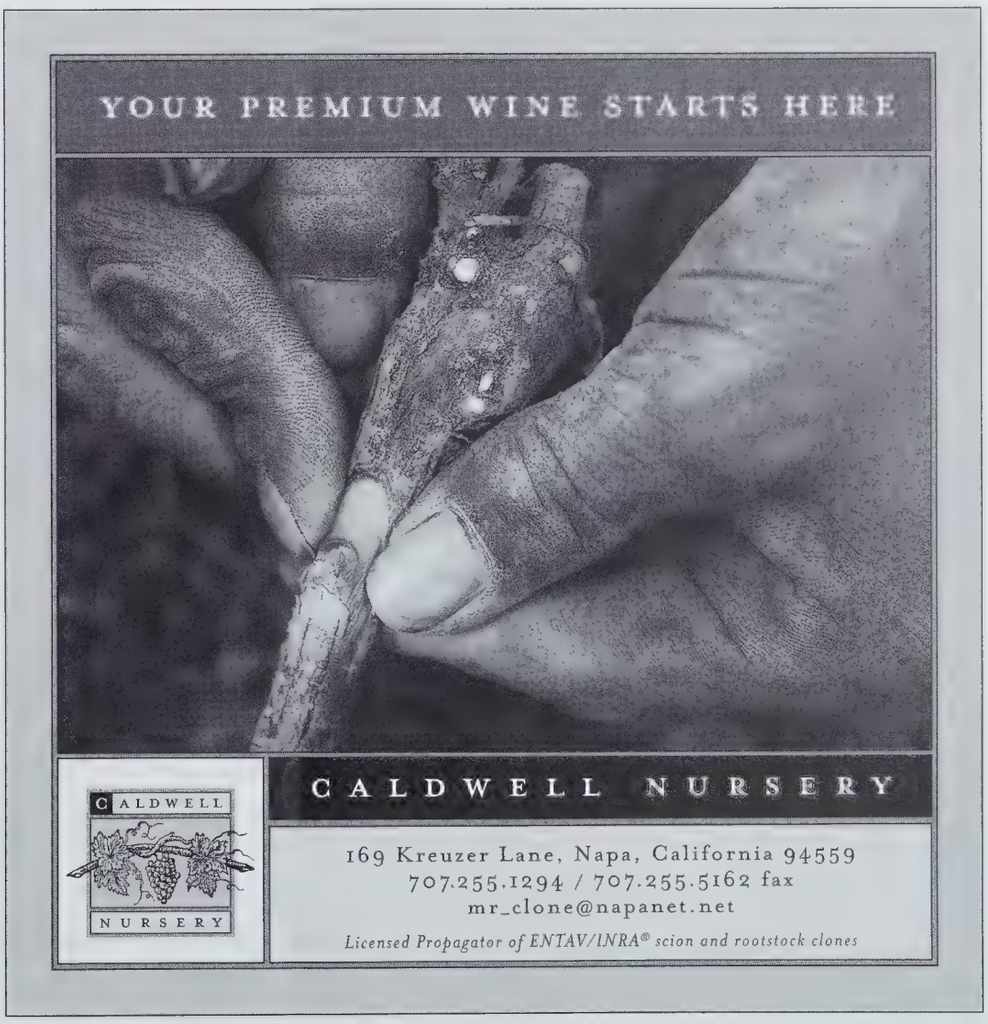
Zouzounis believes that pre-fermentation maceration (cold soak) improves color extraction. "Doing it, however," she says, "depends on the vintage — what the fruit looks like and how warm or cold it is. I do not do a cold soak (56°F) if there's potential for skin deterioration during fermentation, because we don't have a sorting table. If there's rot that's impossible to pick out, then I do not cold soak."

To eliminate the need for extended maceration, Cohn routinely conducts a three-day cold (45°F) soak for better color extraction, improved flavor and aromatics, and tannin softening.

Zouzounis also dislikes extended maceration with Zinfandel. "After fermentation," she reports, "skins are so macerated that I don't understand the benefit. Also, Zinfandel does not have the kind of tannins that Merlot or Cabernet Sauvignon do."

For warm climate Zinfandels, Rosenblum prefers a cold soak period followed by warming and pump-overs during fermentation. For cool climate Zinfandels (Napa, Sonoma, and Mendocino sources), he chooses whole clusters (because this improves aromatic and flavor profiles), open-top fermentors, and punch down.

All producers prefer skin contact for a maximum of 7 to 12 days only.



Yeast choices

Lytton Springs is alone in choosing uninoculated fermentation.

Known for his many yeast experiments, Cohn ferments each lot with a different yeast culture. He likes Jackass, a Williams-Selyem isolation from the Martinelli Jackass Vineyard, now known as VQ-11.

Cohn notes that BM-45 brings out spicy components and brighter cherry qualities. D-80 enhances a peppery component extracted from the grapes. Syrah yeast, also used by several other interviewed winemakers, enhances darker and richer wine components.

Fermentation temperature

Lytton Springs and Rosenblum achieve higher peak fermentation temperatures around 93°F and 92°F.

At about 93°F," Olney indicates, "we get the extraction that we want without going over the line to extract tannins that we don't want. The tank retains peak temperature for 8 to 12 hours."

Generally, Zinfandel from Quivira ranches comes in cold (under 60°F), then sits in 1.5-ton fermentors for a few days before yeast inoculum. Once inoculated, fermentation begins and hits a peak of 85°F and no higher."I have not tried to heat the fermentors to learn whether a higher maximum temperature would be better," Wann admits. "In the 4-ton fermentors we previously used, the wine reached a higher maximum temperature. Yet, I'm happy with the extraction we're getting at a lower temperature.

"After cold soak and before the skins begin to break down, I like the early low alcohol extraction. I prefer more intact berries that result from cooler extraction and less time at high temperature and higher alcohol. It all comes down to style preferences."

Zouzounis brings up vintages again. "It's one thing to discuss a single year as opposed to winemaking preferences in general. There have been times when the fermentation starts off slow and cool and overnight sugar levels have reduced by 15° Brix in 8 hours. I had one plan in mind and the vintage had another."

Rosenblum believes the key is a focus on the bell-shaped extraction curve, achieving extraction over a broad range of temperatures. "In a perfect vintage, you get this," he adds.

Building a spice rack

Historically, barrel choice at Quivira has leaned toward French oak rather than American oak. Barrels are "broken in" during Sauvignon Blanc production. Since Wann prefers to barrel-ferment Sauvignon Blanc in French oak, that also became the oak choice for Zinfandel.

"However," Wann adds, "the more excellent American oak barrels are now in the mix at 20%. Choice has as much to do with the style as the finish of the wine."

Zouzounis views the use of multiple coopers as a cook does salt, pepper,

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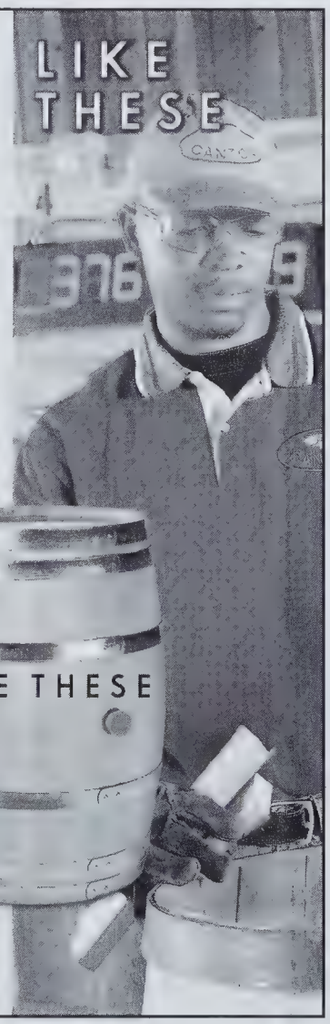

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and different spices in a kitchen rack. She uses new American oak barrels to ferment Chardonnay, which are then rotated into the Zinfandel program. "However," she says, "length of time in barrel is a style preference — and that's a year-by-year call."

For Cohn, it's not just barrels, it's coopers. For Zinfandel, he uses 40 different cooperages and for Rockpile, at least 20.

"I want to be open to more than the idea of French or American oak, but to coopers and oaks also," Cohn contends. "Of the barrels Rosenblum buys, 20% are U-stave, which has a different flavor profile than other American oak cooperages."

A spice rack notion may be expanded by blending varietals for Zinfandel. The foremost blending choice is Petite Sirah. Quivira's Wine Creek Ranch Zinfandel is 5% Petite Sirah.

Yet, as Zinfandel at Rockpile has advanced in age, Rosenblum finds that in most vintages, Petite Sirah is not necessary to enhance the color, phenolics, or spice of ripe Zinfandel.

When Lytton Springs Zinfandel was first made in 1972, fruit from the mixed vineyard created the bottling. Now with better block organization and new plantings, Gates can also select individual varieties from most parts of the vineyard. Olney ferments the lots separately and blending choices are made later.

Last drop

Modern-day DNA profiling identified the Croatian grape Crljenak Kasteljanski as identical to Zinfandel. Yet, California, and more specifically Dry Creek Valley, has brought world renown to both the Zinfandel grape and the wine.

As consumer association of Zinfandel with California and Dry Creek Valley grows, it is time for some producers to showcase site specificity.

Mazzocco, Quivira, Ridge Lytton Springs, and Rosenblum are on the leading edge of developing individuality in regional blends and vineyard designates. Others who follow in their footsteps will benefit from the roads they've paved in telling the story of Dry Creek Valley and understanding Zinfandel as an expression of a single vineyard. ■

TASTING NOTES

2001 Mazzocco Cuneo & Saini Zinfandel

Color/Aroma: Light crimson. Strawberry, bright cherry, raspberry, mint, and peppercorn spice.

Flavors: Strawberry, raspberry, rhubarb, and hints of tea.

Balance/Finish: Rich, soft, and silky. Easy to drink.

2001 Quivira Anderson Ranch Zinfandel

Color/Aroma: Purple-crimson. Rich dark cherry, plum, and black raspberry; earthy, dusty and mint notes with exotic brown spices.

Flavors: Bright fruit, plummy with hints of chocolate and coffee.

Balance/Finish: Good acid, great palate texture, firm structure, long and spicy; an elegant and unpretentious Zinfandel.

2001 Quivira Standley Ranch Zinfandel

Color/Aroma: Medium crimson. Ripe cherry with elements of cinnamon and vanilla; vibrant red fruit, plums, vanilla, mint, earthy/dusty.

Flavors: Bright cherry, raspberry, and strawberry with spice; tangy acid; cream soda.

Balance/Finish: Juicy and rich with long, bright, red fruit finish.

2001 Quivira Wine Creek Ranch Zinfandel

Color/Aroma: Bright crimson. Dark cherry, boysenberry, cinnamon.

Flavors: Fresh boysenberry, black cherry, element of licorice and other spice, lively acid.

Balance/Finish: Lingering, full, and well balanced.

2001 Ridge Lytton Springs Zinfandel

Color/Aroma: Purple. Dark plum with nuances of black cherry, blackberry, rosebuds, and Herbes de Provence.

Flavors: Blackberry, black currant, and ripe plum with a hint of cherry.

Balance/Finish: Soft, lush mid-palate with structured long finish.

2001 Rosenblum Rockpile Road Zinfandel

Color/Aroma: Purple opaque. Black currant, cherry, mint, bacon, spicy vanilla, hint of coconut, and toasty oak.

Flavors: Ripe blackberry, plum, sweet boysenberry, spice, and chocolate.

Balance/Finish: Supple, rich, big mid-palate, great structure and length.

PWV thanks Quivira Vineyards for hosting the discussion/tasting.

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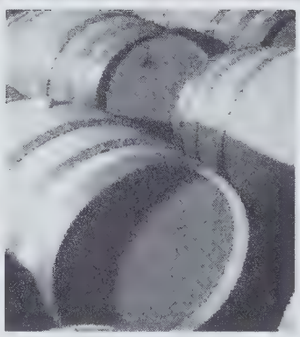
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Dry Creek single-vineyard Zinfandels (They've got) PERSONALITY

BY Mary Evely

When I began tasting foods to match up with single-vineyard Dry Creek Valley Zinfandels, it quickly became apparent the wines were not going to line up obediently and fit into a group norm. Upon reflection, that made perfect sense for these wines, made from vineyards singled out specifically by their winemakers for the unique qualities the grapes displayed. Each of these wines has a notable personality, with its own complexity of flavor and structure.

Guidelines

There are two general guidelines for ensuring the best experience when serving vineyard-selected Zinfandels from Dry Creek Valley. Even though the wines are generally big and intense, strong tastes in food often overwhelm the more subtle individual qualities of each. Because the wines are complex, dishes with many flavor components tend to compete for the palate's attention. The best dining experiences will be had by choosing foods with medium flavor intensity, prepared in a simple, straightforward way.

Go-to foods

If I had to choose one food to complement all these wines, it would be pork. At a tasting organized for a group of experienced palates, a dry-spice rubbed pork loin, roasted and served with soft polenta, was an across-the-board winner. Barbecued pork with cabbage slaw also brought smiles all around the table. (The barbecue sauce was homemade to ensure that the tomatoes were kept as a minor note, and it was not too hot or too sweet.)

Shrimp were the hands-down best in the seafood department. Whether grilled or stir-fried with garlic and ginger, shrimp convey enough flavor to match the flavor intensity of these Zinfandels.

In addition, almost all game, from rabbit to venison, has an intensity of flavor and fat, delivered in a non-aggressive way, that matches the richness of the fruit in these wines.

Against type

There are many foods, which we think of as naturals for Zinfandel, that did not work in our tasting, unless they were carefully modified to keep them in line.

Tomatoes are at the top of this list. The sweet-sour profile of tomatoes is always a danger in wine pairing, but Zinfandels generally can handle them. Not these. The bright, zippy flavors of tomato preparations clashed with the deep, dense fruit in the wines.

Also a surprise, both black and white beans seemed too sweet and unctuous to show the wines well.

Dungeness crab and white-fleshed fish did not interfere with the wine flavors, but their delicacy tended to make the wines seem overly heavy. Parmesan cheese was too sweet and too salty (go figure). My guess is that the intense flavors of the Parmesan were just too strong.

Another surprise was a conflict with fatty and pungent nuts, such as hazelnuts, pine nuts, and macadamias.

Although I'm sure most people would not object to lamb being served with Zinfandel, I found its strong flavor affected some of the wines in off-putting ways. I wouldn't chance it.

Finally, although medium-hot spice usually works with Zinfandel, extreme caution is advised when including chili in any form. A Thai BBQ sauce was not excessively hot, but the typical sweet/sour/hot profile in total still obliterated every nuance in each of these wines.

Standard cheese caveat

As is always the case, care must be taken in selecting cheeses. After the shock of discovering the conflict with Parmesan mentioned above, a serious cheese tasting ensued. The conclusion is to follow Goldilocks: not too strong, not too mild; not too hard, not too soft; not too fat, not too delicate; not too sweet or salty, not too bland.

The cheeses in the middle, the semi-soft group with medium flavor intensity, are just right. Choose fresh goat cheeses, good quality jack, gruyere, Italian fontina, or taleggio. If Basque sheep-milk cheeses, such as Ossau Iraty, are available in your market, they also work well.

So much for the generalities we can convey about foods for the Dry Creek Valley vineyard-designated Zinfandels. Beyond these, it is worthwhile to refer to the brief portraits of each wine below.

Mazzocco Cuneo & Saini Zinfandel 2001

This wine displayed the most delicacy of the group. Even fresh hot-smoked salmon[1] tended to overshadow it. This wine was trashed by cheddar and blue cheeses, as well as a salty Provençal pork paté. This was the best pick, however, for a Dungeness crab taco and light-on-the-tomato cioppino, and salads with not-too-acidic vinaigrettes. This is the most tomato-tolerant of the group.

Quivira Anderson Ranch Zinfandel 2001

The balance of fruit and acid in the Anderson Ranch made it a notable winner with all kinds of salads. Everything from a celery-root remoulade to peppery arugula with fennel and red bell pepper, to bitter greens with balsamic vinaigrette, worked well. Hot-smoked salmon, as mentioned above, was OK, but still tended to overwhelm, as did the pork paté.

Quivira Standley Ranch Zinfandel 2001

This is similar in profile to the Anderson Ranch, with an additional aspect of butteriness coming out in some of the pairings. A wild mushroom ragout with a cream base is an excellent choice.

Quivira Wine Creek Ranch Zinfandel 2001

A step up in flavor intensity, also with buttery notes, made a successful match with the hot-smoked salmon or a pork paté. Avoid raw vegetables with sweet aspects, such

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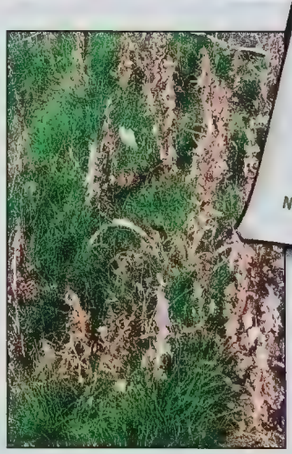

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as corn, carrots, and sweet bell peppers.

Ridge California Lytton Springs 2001

Although this wine with 76% Zinfandel could legally be labeled as such, I think Ridge was wise not to do so. The 17% Petite Sirah lends a firmer structure, which has a definite impact on how it works with food. This is the one wine in the group that was excellent with lamb, both grilled chops and braised shanks. Blue cheeses, including Stilton, are good here, but cheddar and Parmesan increased the perception of tannins. Forget the salads.

Rosenblum Rockpile Road Zinfandel 2001

This is a really big wine with very ripe fruit flavors. It is a show-stopper with Stilton and got a gold star with barbecued pork. You would think some fruit nuances in an entrée could work here, but no. Even grilled chicken marinated in pomegranate molasses diminished the wine.

[1]The hot-smoked salmon tasted was not the usual vacuum-packed product found in most markets. A Santa Rosa, CA, fisherman rigged up his own smoking device using an outdoor grill, and he smokes it on the spot at the Santa Rosa Farm Market. His salmon has those wonderful wood-smoke flavors but is moist and tender. Just go to the parking lot of the Veterans Memorial Building in Santa Rosa between 9:30 and 11:00 AM on Saturday morning and follow your nose.

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methods for preparing foods for these Zinfandels.

- Keep tomatoes very controlled in any dishes, so their fruit sugars and acids do not dominate.
- Although a well-made hamburger would be tasty (careful with that ketchup!), a more formal entrée seems more appropriate for the special nature of these wines.
- Dishes with medium flavor intensity and a moderate amount of fat will show the wines to their best advantage.

Summary: Food affinities and conflicts

Given the individuality of Dry Creek Valley single-vineyard Zinfandels, it is difficult to make blanket recommendations for food pairings. For the affinities list, I include only foods that work well with all of the wines. For the conflicts, I include foods that cause a problem for any of them.

AFFINITIES

Seafood: Shrimp, ahi tuna

Meat and poultry: Chicken, rabbit, quail, squab, duck, venison, beef, pork

Herbs and spices: Basil, thyme, bay leaf, filé, very mild chili, oregano, paprika, mustard, black pepper, savory, ginger

Sauces: Mild barbecue, meat and red wine reductions, cream sauces with deep flavors, and mild salsa

Cheeses and nuts: Fresh goat cheese, jack, fontina, taleggio, pecorino, walnuts

Fruits and vegetables: Eggplant, zucchini, chard, kale, spinach, radicchio, endive, arugula, red-leaf lettuces, mustard greens, morels, black chanterelles, portobello and shiitake mushrooms, potatoes

Legumes, grains and olives: Polenta, lentils, wild rice, quinoa; kalamata, niçoise and picholine olives

CONFLICTS

Seafood: All delicately flavored fish, oysters

Meat and poultry: Smoked chicken, veal

Herbs and spices: Cumin, curry, dill, lavender, rosemary

Sauces: Tomato, citrus, fruit

Cheeses and nuts: Aged goat cheeses, all strong aged cheeses, cheddar, blues, brie, Parmesan, hazelnuts, pine nuts, macadamias

Fruits and vegetables: All fruits, corn, carrots, asparagus, green beans, peas, sweet potatoes, winter squash, bell pepper, artichokes

Legumes, grains and olives: Black beans, white beans, oil-cured olives ■

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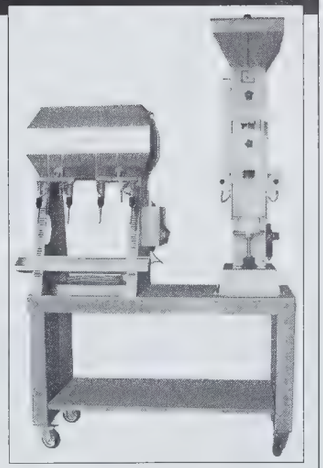

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Large infestations of vine mealybugs can lead to defoliation, berry damage, and rot.

VINE MEALYBUG

Formidable pest spreading through California vineyards

BY Kent Daane, Associate Specialist, University of California Extension, UC Berkeley;
Ed Weber, Napa County Farm Advisor, University of California Cooperative Extension;
Walt Bentley, Entomologist, University of California Statewide IPM Project

Several species of mealybugs are pests of grapevines in many parts of the world. In California, the grape mealybug, long-tailed mealybug, and obscure mealybug have long been present in vineyards, but they are usually minor pests not requiring chemical control. Recently, the invasive vine mealybug (VMB) has emerged as a serious pest in many parts of the state. It brings with it the need for aggressive chemical management.

Distribution and damage

Vine mealybug is found in the Mediterranean regions of Europe and North and South Africa, as well as grapegrowing regions in the Middle East, Argentina and Mexico — and now in California.

In California, vine mealybug was first discovered in 1994 in table grape vineyards in the Coachella Valley (Riverside County), although it probably entered the state a year or two earlier. It spread throughout the Coachella Valley, and in 1998 was found in the southern San Joaquin Valley (Kern County).

Its dispersion into new regions has been dramatic: VMB was found in Fresno County in 1998, Santa Barbara County in 2000, San Luis Obispo County in 2001, and in El Dorado, Madera, Monterey, Napa, Sacramento, Sonoma, and Stanislaus counties in 2002. To date (March 2004), VMB has been found in 17 counties in California (Table I). It is likely that there are more infestations that have yet to be identified or have not been reported.

Circumstantial evidence suggests this rapid dispersion resulted from movement of infested vineyard equipment (mechanical harvesters, bins, tractors, etc.) and through sales of infested nursery stock (from 1998 to 2003). Other possible factors include spread with field crews and natural dispersion (such as birds and wind-blown infested leaves).

Mealybugs are phloem feeders. As they feed, they produce a sugary excretion (honeydew) that supports the growth of sooty mold. Infested clusters become contaminated with honeydew, sooty mold, egg sacs, and lots of mealybugs.

In southern California, severe vine mealybug infestations have also reduced vine growth and resulted in defoliation, bunch rots and even spur and cane death. In addition, like other mealybugs, vine mealybugs can spread grapevine virus diseases, such as leafroll and corky bark.

Several factors make vine mealybug much more damaging and difficult to control than other mealybug species:

- First, the vine mealybug reproduces at a higher rate than other species, enabling small numbers of mealybugs to reach damaging levels in one season. Females can each deposit up to 700 eggs (average is approximately 300).

In San Joaquin Valley, vine mealybug has four to seven generations per year compared with two for the grape mealybug. This greatly increases the population size, and it leads to overlapping generations. The overlap makes chemical control more difficult, since some insecticides are effective only against the nymphal stages.

- Second, vine mealybug excretes much more honeydew than other species. This honeydew can cover leaves, canes, trunks and fruit, making entire clusters and vines a sticky mess. The honeydew often becomes so thick it resembles soft candle wax.

Fruit from heavily infested vines is not suitable for harvest. The stickiness of

Cabernet Sauvignon infested with vine mealybug. This degree of honeydew buildup is typical of the damage that occurs in warm areas (San Luis Obispo County, in this case). [Photo by Mark Battany]

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Sex-pheromone baited traps are being used to monitor male vine mealybug flight times and densities.

all the plant parts also facilitates spread of VMB from vineyard to vineyard on equipment and worker clothes.

- Third, vine mealybug can feed on all parts of the vine throughout the year. It can be found on leaves, in clusters, under the bark, and even on the roots of grapevines. By hiding under bark or on the roots, VMB is protected from most foliar insecticides, from high summer temperatures, and from parasitoids and other natural enemies.
- Fourth, vine mealybug is not native to California, so it has fewer natural enemies than the grape or longtailed mealybug species. Established populations will require repeated insecticide treatments to keep them at manageable levels.
- Finally, vine mealybug has a wide host range. It can feed on subtropical (grapes, figs, apples, and citrus) and tropical (dates, bananas, avocados, and mangos) crops as well as a number of common weeds, such as malva, burclover, black nightshade, sowthistle, and lambsquarter. However, in California, grapevines appear to be its preferred host throughout the season.

Population cycles

Vine mealybug population cycles and its distribution on vines can vary dramatically, depending on temperatures and vine condition. While it can be found on all parts of the vine at any time of the growing season, there are clear dispersal and abundance patterns that influence the amount of damage and the effectiveness of chemical and biological controls.

For example, in the Coachella Valley, most of the vine mealybug population overwinters on the roots and lower trunk sections. As temperatures warm, populations rapidly increase reaching a peak in April and May. Accompanying the increased density is the pest's movement up the vine, from the roots and lower trunk to the leaves and grape clusters.

Management becomes a race between the table grape harvest (May-June) and the time when mealybugs reach the clusters. With hot summer temperatures after harvest, the population decreases and again is found primarily on the lower trunk and roots. There is another population increase in fall, before the overwintering period.

In San Joaquin Valley, vine mealybugs also overwinter on the roots and lower trunk, and as the temperatures warm in spring and summer, they move up to the leaves and bunches. Unlike in Coachella Valley, populations continue to increase during summer, and they remain on leaves until August.

All stages were found throughout the summer, feeding on leaves and canes in exposed locations, suggesting that San Joaquin Valley temperatures had little effect on vine mealybug densities. A late-season reduction was not accompanied by an increase in summer temperatures, but was associated with increased parasitism levels. Nevertheless, the longer the mealybugs remain on leaves and clusters, the more damage they cause to the crop.

In the Central Coast and North Coast, VMB appears to follow a pattern similar to San Joaquin Valley. However, the populations continue to increase through September and October. The late season increase is most likely due to an absence of parasites in these areas. As in other regions, considerable damage is likely to occur unless insecticides are used. Because most VMB infestations are still discrete in these regions, eradication programs are being attempted in some counties.

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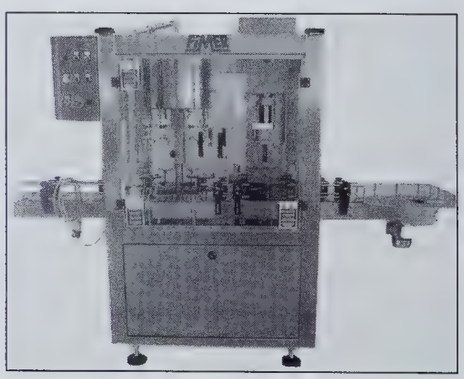

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Potential for further spread

Until recently, little attention was given to vine mealybug, leading to its rapid spread throughout California. This history shows how easily it can be moved, both within grapegrowing regions and over long distances. With more attention now focused on vine mealybug, its further spread should be slowed, although complete control is not likely to occur.

The sticky nature of the honeydew produced by vine mealybug greatly facilitates its spread. All parts of the vine get very sticky — leaves, canes, berries, clusters, cordons, and trunks. Adult insects, nymphs, and eggs can get stuck to tractors, bins, picking pans, gloves, etc., and can thereby be transported to other locations.

Machine harvesters pose a significant risk because they operate in vineyards when populations are high. They have considerable contact with fruit and foliage, and are frequently moved from vineyard to vineyard. If operated in an infested block and then moved without a thorough cleaning, spread could easily result. Operators need to be made aware of any vine mealybug infestations in blocks they are harvesting, and growers should discuss equipment sanitation practices if using a contract harvesting service.

Movement of infested nursery stock has resulted in numerous infestations throughout California. Some nurseries have recently implemented prevention measures that should greatly reduce the chances of further introductions on plant material. In addition, the California Department of Food and Agriculture (CDFA) has issued a nursery advisory that requires monitoring and/or sanitation protocols for VMB.

Nursery sanitation practices include hot water treatment of cuttings and dormant vines, insecticide applications to green-growing plants, and insecticide applications to nursery mother blocks. CDFA regulations do not require nurseries to take all of these steps, so it is prudent for buyers to discuss vine mealybug control practices with their nursery sources prior to purchasing vines.

Table I. Counties with VMB infestations

Alameda	San Joaquin
El Dorado	San Luis Obispo
Fresno	Santa Barbara
Kern	Santa Clara
Madera	Sonoma
Monterey	Stanislaus
Napa	Tulare
Riverside	Yolo
Sacramento	

Furthermore, while hot water treatments for dormant wood can provide excellent control, insecticide treatments of green-growing plants have not yet been thoroughly tested.

Grape clusters harvested from infested vineyards could also lead to

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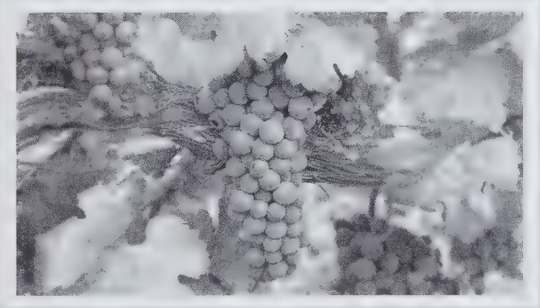

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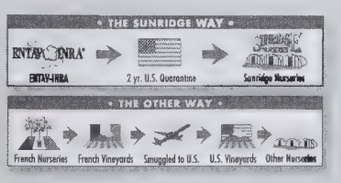

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spread of VMB because the stems will likely still contain insects or eggs after passing through a winery crusher/destemmer. If spread directly back into vineyards, new infestations could result.

Composting infested stems (away from any vineyards) should provide adequate control, as long as the composting process follows state regulations and proper temperatures are reached within the compost piles (above 130°F). Further research is needed to confirm the effects of composting on infested stems.

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An adult male vine mealybug (the only stage that has wings), near an adult female which is beginning to deposit a waxy "ovisac" that contains the eggs.

Monitoring

To prevent damage from vine mealybug, the best way is to keep the pest out of vineyards or to chemically treat populations when an infestation just begins. However, mealybugs are difficult to detect in the early stages because they are often hidden under bark or underground. Visible signs of an infestation include the presence of foraging ants, honeydew or sooty mold on leaves or trunks, bark that appears wet, and white wax protruding from underneath the bark.

Until recently, visual sampling methods were the only way to spot new infestations, and they were far too labor-intensive to be practical. In 2001, a faster, more effective method to monitor VMB was developed, based on a sex pheromone that female VMBs use to attract winged adult males.

This pheromone has now been synthetically produced. In field tests, traps baited with synthetic pheromone were attractive for two months, had an effective range of about 300 feet, and had counts that could be correlated with VMB densities in the vineyard. Using this sex pheromone to attract winged males is a far more efficient method of detecting new infestations than trying to search thousands of vines for hidden females.

Unfortunately, the males are extremely small (less than 1/64 of an inch) and difficult to identify without considerable training and experience. Many growers are establishing their own trapping programs and are work-

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An adult female vine mealybug just before she begins to produce eggs. Note the short "tail" filaments that help to distinguish the vine mealybug from other vineyard mealybugs.

ing with their local agricultural commissioner's office for help in identification of insects in their traps.

Male vine mealybugs are tiny (a bit smaller than adult thrips) and brown-to-black in color. They have a single pair of wings, a small "V" tail, and long antennae. In sticky traps, they quickly lose their coating of white wax and become even more difficult to identify. For this reason, examine traps as soon as suspicious insects are observed. Remember that "close up" photographs make the insects look larger and easier to identify.

Trapping programs

In California, free traps and lures may be available in 2004 from county agricultural commissioners. The preferred trap is the tent-shaped Pherocon® IIID trap (www.trece.com) loaded with a vine mealybug pheromone lure (www.suterra.com). These three-dimensional traps provide better adult male VMB catch and lower "unwanted" insect catch as compared with flat traps.

Traps should be hung at or above the cordon and near the center of the vine. Trellis wires make a good attachment point. Traps can be placed in the canopy to get some protection from wind and equipment, but the open ends should be exposed so that VMB males can easily fly, rather than walk, into the trap. The trap position may have to be changed during the season to avoid interference with vineyard management operations.

Two traps are suggested for each 20- to 40-acre block monitored. Put one trap near the center of the block and the other in a "high traffic" area (near roads or intersections, equipment storage areas, field shops, or packing houses).

There is no reason to place traps deep inside the vine or well within a vineyard block such that crews cannot easily find and monitor them. If more traps are used, they should be placed at least 30 rows apart (about 200 to 300 feet) and at least 10 vines from the edge of each block. Make sure the triangular entrance to the trap is not blocked by leaves. This will reduce the number of males caught.

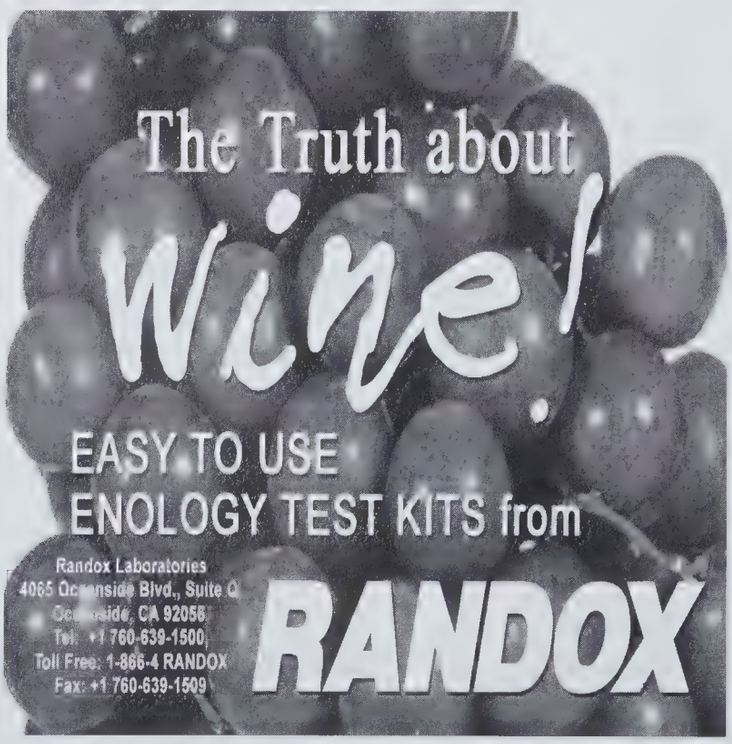
Traps should be checked every two weeks during the male flight period (see below). Lures should be changed at least every six to eight weeks. Traps need to be changed only when they are old and dirty, or when male VMB are detected (so they can be confirmed microscopically and counted). If no male mealybugs are found and the sticky surface is still functioning, new lures can be placed into old traps.

In heavily infested vineyards, we have found over 2,000 males weekly per trap. Typically, an infested vineyard will have between 20 to 300 males per trap per week. If fewer than 10 VMB males are found weekly in a trap, then the infestation may be in another block. Trapped males may be from neighboring or even distant blocks, as the males can be wind-blown from one-half mile or more away.

In those counties where vine mealybug does not commonly occur, vineyard managers should contact the county agricultural commissioner's office and the UC Cooperative Extension farm advisor to get a positive identification of trapped mealybugs, and to discuss management decisions and compliance agreements as necessary.

Male flight periods

In Coachella Valley, the male flight period extends from about March through August. In San Joaquin Valley, the flight will run from May through October. On the North Coast, males



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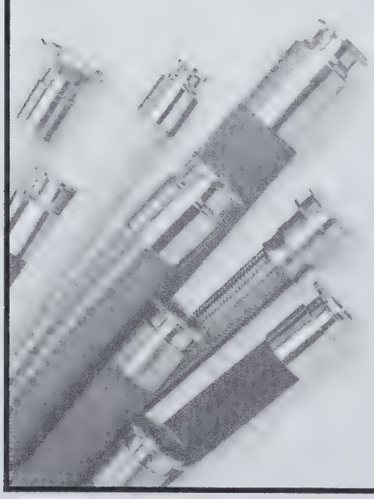

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have been trapped from May to November, with the largest numbers occurring late in the season. Females often mate in the fall, so the first male flight in the following spring may be after vine mealybug activity begins.

Chemical controls

A number of insecticides can be used to kill exposed vine mealybug, especially the small nymphal stages. The hidden portion of the population is harder to control. For this reason, vine mealybug is difficult to eradicate once it has become well established in a vineyard. Systemic insecticides (such as Admire®) that reach all parts of the vine have been the most effective. A control program attempting to eradicate vine mealybug should include:

- Delayed dormant application of Lorsban (February or March),
- Spring application of Applaud or Sevin (Sevin may cause mite outbreaks),
- Systemic application of Admire in spring,
- Summer to fall foliar treatments (Applaud, Dimethoate, Imidan, Malathion),
- Post-harvest application of Lorsban.

Be sure to follow all instructions on the manufacturers' labels, and check for restrictions on use and proper safety considerations for your area. For more information on chemical controls, contact your local University of California Cooperative Extension farm advisor or county agricultural commissioner. For University of California guidelines and a list of registered materials, see http://www.ipm.ucdavis.edu/PMG/r302301911.html.

Biological controls

A number of predators and parasitoids have been recorded attacking vine mealybug in California. Many common general predators will feed on all vineyard mealybug species, including vine mealybug.

Vine mealybug is closely related to the citrus mealybug, sharing a number of parasitoid species that are already present in California. Additionally, recent foreign explorations for new parasitoids have added to the parasitoid complex.

Anagyrus pseudococci is the most common parasitoid attacking vine mealybug. It is well established in the San Joaquin Valley. The adult female is about 1/32 of an inch (2 mm) in length, golden brown in color with long antennae that are black at the base and then white to the ends. The male is smaller, dark-colored with hairy antennae.

In the laboratory, *Anagyrus pseudococci* attacked second, third, and adult stage vine mealybugs at rates of 19%, 33%, and 48%, respectively, indicating that it prefers larger mealybugs. Parasitoid development time is about 18 days during the summer.

In field trials, this parasitoid attacked 70% to 95% of the exposed vine mealybugs in August and September in San Joaquin Valley. However, considerable damage to

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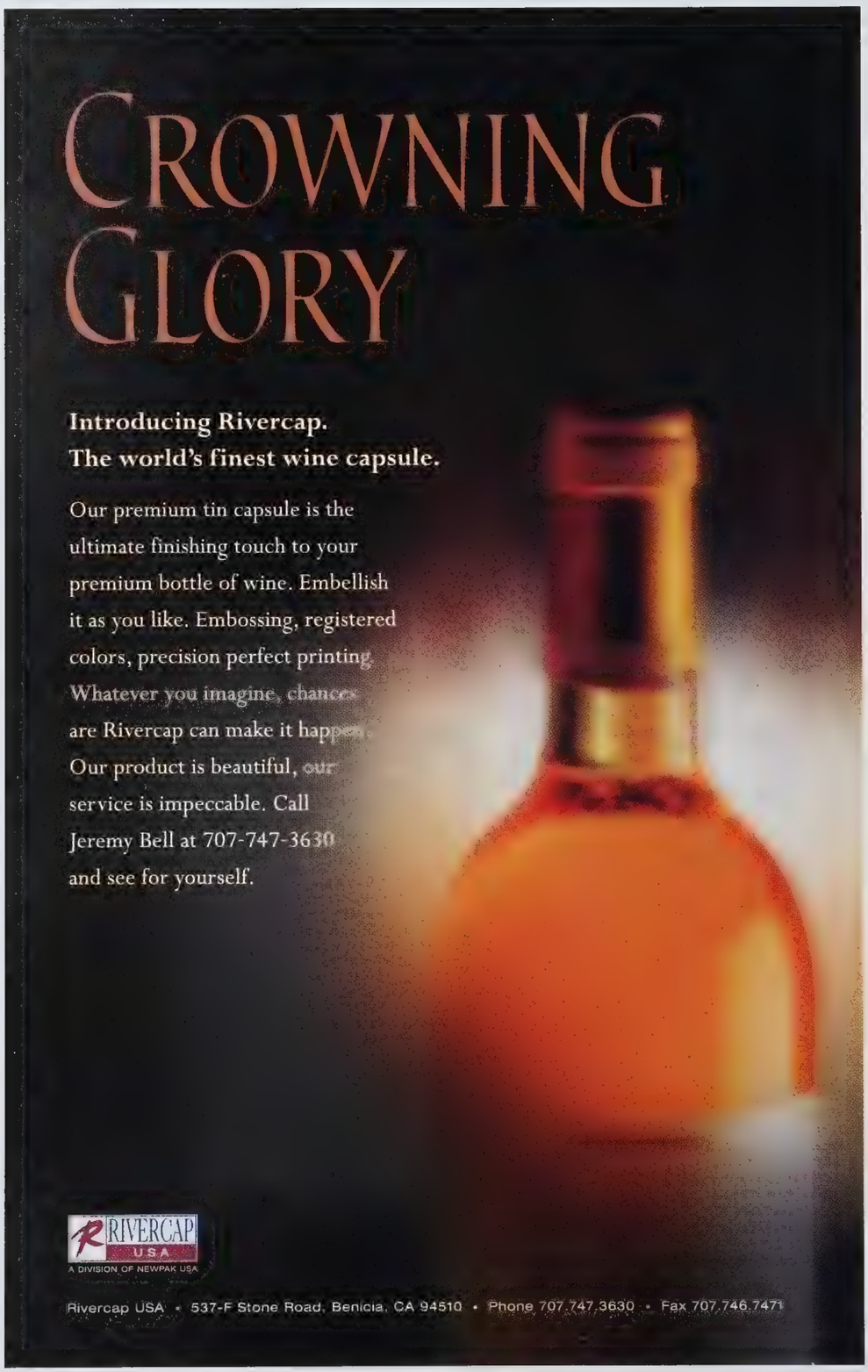
fruit still occurred. Parasitism in Coachella Valley was lower, never exceeding 20% (unless parasitoids were released). The difference in parasitism levels between these two regions is largely attributed to the greater period of mealybug exposure to parasitoids in San Joaquin Valley.

Parasitism rates can be improved by releasing *Anagyrus pseudococci* early in the season. Studies suggest that an early season release of 20,000 parasitoids per acre has increased parasitism and reduced crop damage, although this research is still in progress and may vary greatly among vineyard regions.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Introducing Rivercap.
The world's finest wine capsule.
Our premium tin capsule is the ultimate finishing touch to your premium bottle of wine. Embellish it as you like. Embossing, registered colors, precision perfect printing. Whatever you imagine, chances are Rivercap can make it happen. Our product is beautiful, our service is impeccable. Call Jeremy Bell at 707-747-3630 and see for yourself.
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Leptomastidea abnormis was recently released in Coachella and San Joaquin valleys. The adult is slender, about 1/32 of an inch (2 mm), and patterned white and black, including the antennae. *Leptomastidea abnormis* is not as common as *Anagyrus pseudococci*, and it currently accounts for less than 10% of the parasitism. In the laboratory, *Leptomastidea abnormis* attacked second, third, and adult stage vine mealybug at rates of 61%, 32%, and 7%, respectively, indicating that it preferred smaller mealybugs.

While predators and parasitoids may help reduce the overall number of vine mealybugs present, they alone will not provide sufficient control to keep populations below damaging levels.

Future prospects

Vine mealybug is a pest that no one wanted. Along with its potential for damaging vines and reducing marketable yields, it brings with it the need for considerable insecticide use. This runs directly counter to the industry's move towards sustainable farming methods and reductions in pesticide use.

Continued vigilance is needed to reduce vine mealybug populations and to limit its further spread, both within vineyards that are currently infested, and from infested vineyards to non-infested ones. Growers should train all workers in mealybug identification and react quickly to any new finds.

Managers of infested blocks should follow all recommended treatment protocols and manage their equipment and workforce to minimize spread.

Wineries need to be aware of the status of vineyards delivering fruit to them, and they must take steps to properly dispose of stems coming from infested blocks. Grapevine nurseries should implement quality assurance measures to prevent further spread on plant materials.

Unfortunately, vine mealybug is a pest that is here to stay in California. However, if everyone takes appropriate steps, its overall impact should be reduced. ■

Additional sources of information:
http://www.vinemealybug.uckac.edu/
http://cenapa.ucdavis.edu/Viticulture/Vine_Mealybug.htm

Winemaking Supplies

Malolactic Cultures **Yeast** **Yeast Nutrients**
Fining Agents **Wine Thieves** **Scales** **Enzymes**
Filter Media **Oak Alternatives** **Lab Equipment and Supplies**

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Pickering Winery Supply

Pickering Winery Supply distributes a special potassium casseinate, Vinpur Special, from Meggle of Germany. Cassein has long been recognized in Burgundy and Australia as an effective, gentle way of removing bitterness, brown pigments, and oxidized phenols in red and white wines. While many winemakers in the U.S. have tried it, even more have been put off by the difficulty of how to add this casseinate to a wine.

By using cellulose as a carrier, Meggle has solved this problem with a product that can be directly dispersed in your wine. This means that casein's excellent characteristics in the lab can be easily reproduced in the winery; a predictability that allows you to selectively target different components in a wine.

Most wineries that have tried it look upon Vinpur-Special as more than just a problem-solver: it has become an integral part of their winemaking.

For more information, contact:
Pickering Winery Supply
John Pickering
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617

PLEASE SEE PICKERING WINERY SUPPLY AD, PAGE 63.

St. Patrick's of Texas

St. Patrick's of Texas offers an assortment of laboratory supplies including:

- Ebulliometers,
- 0-32 and 0-10 Brix refractometers with and without ATC,
- Alcohol refractometers with and without ATC,
- Hydrometers with built-in temperature compensation,
- Benchtop, portable, and pocket pH meters with glass electrodes,
- Electronic scales,
- Digital and bimetal thermometers,
- Hygrometer (relative humidity).

For more information and on-line ordering, please contact:
St. Patrick's of Texas
1828 Fleischer Dr., Austin, TX 78728
tel: 512/989-9727; fax: 512/989-8982
e-mail: stpats@bga.com;
website: www.stpats.com

PLEASE SEE ST. PATRICK'S OF TEXAS AD, PAGE 35.

St. Patrick's of Texas

XTRAOAK

XTRAOAK is the oak adjunct division of Canton Wood Products (producer of the Canton American oak barrels). For more than 30 years, we have been producing the highest quality American and French oak adjuncts for the domestic and international wine industry.

XTRAOAK products include French and American oak chips, granular oak (for use during fermentation), stave inserts for barrels and tanks, and two XTRAOAK exclusives: XOAKERS (1-inch solid oak spheres for use in barrels and small storage containers), and the innovative OAK-ON-A-ROPE oak chain for oak renewal of neutral barrels. All XTRAOAK oak is naturally seasoned and carefully toasted, employing time-tested techniques of the cooper's craft.

XTRAOAK products offer winemakers convenient oak options that can add interest and character to wines at a reasonable cost. In addition, XTRAOAK OAK experts are available to answer your oak adjunct questions and to provide the best technical support.

For more information, contact:
XTRAOAK
5793 Skylane Blvd #B, Windsor, CA 95492
tel: 707/836-9742; fax: 707/836-9759
e-mail: canton@cantonwood.com;
website: cantoncooperage.com

PLEASE SEE CANTON COOPERAGE'S AD, PAGE 52.

VINQUIRY

Yeast Strains: Vinquiry offers Vitilevure 58W3 and Vitilevure MT in its line of Enoferm yeast strains and 40 other yeast strains for suitable matches for fermentation and wine style. The new encapsulated yeast technology, ProRestart and ProDessert are available. ProRestart is for direct addition restart of stuck or sluggish fermentations. ProDessert enables a winemaker to easily remove yeast and stop fermentation allowing the presence of residual sugar. Vinquiry's line of liquid yeast concentrates has been expanded.

Nutrients: A variety of nutrients are offered. ActiML is a nutrient for direct addition malolactic bacteria and OptiRED is an inactive yeast product to improve body, color stability, and mouthfeel in red wines. Nutrient selections include Go-Ferm, a source of bioavailable micronutrients added directly to the yeast rehydration water. Trials have shown improved fermentation rate and shorter time to dryness at the end of fermentation. Nutrients Fermaid K, Actiferm 1 and 2, Cerevit, and Oenovit are available. A new bacteria strain, Enoferm Beta, has been added.

Fining: Carefully selected products from the Martin Vialatte line include Taniraisin, a new grape tannin from white grape must and Efferbaktol 50, a granular form of effervescent SO_2. Other tannins include Oenotan, Tanichene, Polytan Vitif, Sublitan, and Vitanil AS, B, AJ11, and VR.

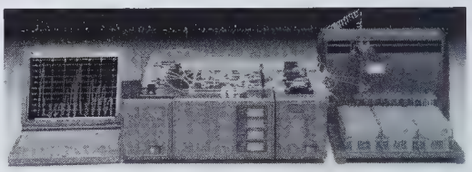
Fining agents include: Aquacol, Gelatin Extra, Gelisol, Albuminocol, Solugel, Cristaline, Miracol, Ovocol, Polycase, PVPP, and Polypresse.

Expanded enzyme selections include Lallzyme Beta, C, EX, EX-V, and the new Lallzyme Cuvee Blanc. A liquid lysozyme, Lallzyme LysoEasy, is also available.

For more information, contact:
Vinquiry
7795 Bell Rd., Windsor, CA 95492
tel: 707/838-6312; fax: 707/838-1765
e-mail: info@vinquiry.com;
website: www.vinquiry.com

ASTORIA-PACIFIC INTERNATIONAL

The Wine Analyzer by Astoria-Pacific International is a reliable, versatile, and rapid analysis system that can test a variety of wine constituents simultaneously. For instance, total SO_2, free SO_2, and volatile acidity levels are routinely monitored in the wine industry. The Wine Analyzer can provide reliable, repeatable, and extremely accurate reports of product quality in wine production.



With introduction of its new six-channel, multi-analysis detector; new powerful data-acquisition software; versatile, high-capacity samplers; and outstanding customer service, Astoria-Pacific has perfected these analyses and has positioned itself as a global leader in automated wet chemistry.

Any winery seeking to automate its current wet chemistries, replace its current automated system, and/or compete in the global economy, should consider the Astoria® Analyzer for its wine analyses.

Contact Astoria-Pacific International, a leader in automated wet chemistry, to learn how the Astoria® Analyzer will help produce the best possible wine.

For more information, contact:
Astoria-Pacific International
Brady Miller
PO Box 830, Clackamas, OR 97015-0830
tel: 800/536-3111 (toll free U.S./Canada)
tel: 503/657-3010; fax: 503/655-7367
e-mail: brady@astoria-pacific.com;
website: www.astoria-pacific.com

Napa Fermentation Supplies

Napa Fermentation introduces a new professional pH kit for winemaking. Produced by Hanna Instruments, this kit stands apart from other pH meters for several reasons: the meter detects when the pH electrode is too dirty to give an accurate reading and warns the handler during calibration; Hanna provides cleaning agents made specifically for the pH electrode ensuring that all measurements are accurate; and the professional pH kit for winemaking utilizes special technology to prevent clogging, allowing pH electrodes to last longer than conventional electrodes.

Napa Fermentation Supplies offers Lalvin fermentation supplies including 22 strains of wine yeast: Lalvin BM45, Lalvin S6U, Lalvin D254, Lalvin CY3079, Lalvin RA17, Lalvin T73, Lalvin R2, Lalvin Zymalfore VL1, Lalvin EC1118 Prise de Mousse, Lalvin 71B, Lalvin K1, Lalvin L2056, Lalvin Wadenswil 27, Montrachet Davis 522, Champagne Davis 595, Uvaferm PM (Prise de Mousse), Uvaferm CEG (Epernay 11), Uvaferm Steinberger, Lalvin RC212, VL3, F-10, and F-5.

Malolactic cultures include X-3, OSU, Inobactor, and MT01. Yeast nutrients are Fermaid K and Fermaid 2133.

A full line of winemaking equipment and supplies, including labware, refractometers, wine thieves, rubber stoppers, fermentation locks, and chemicals are available.

For more information, contact:
Napa Fermentation Supplies
575 Third St., Bldg. A
(Inside the Napa Town & Country Fairgrounds)
PO Box 5839, Napa, CA 94581
tel: 707/255-6372; fax: 707/255-6462
e-mail: wineyes@aol.com; website: www.napafermentations.com

PLEASE SEE NAPA FERMENTATION'S AD, PAGE 59.

Scott Laboratories

New for 2004 from Scott Laboratories, Inc.:

Yeast:

- RB2 (from Laffort) optimizes good color in thin-skinned reds (such as Pinot Noir) with excellent fermentation qualities.
- SVG (from Lallemand) can metabolize up to 25% of available malic acid. This Loire isolate enhances Sauvignon Blanc characteristics.
- M69 (from Lallemand) comes from central Spain where high sugar musts are common. It has a low conversion efficiency of sugar to alcohol and can enhance aromatic complexity of neutral warm climate whites.

Bacteria:

- Scott Laboratories will offer the new Elios 1 direct inoculation culture (MBR) from Lallemand that was specifically selected for high alcohol, high pH, warm region red wines. It has good kinetics and consistently produces wines with positive sensory profiles.

Fermentation management tools:

- Dynastart fermentation nutrient from Laffort is a patented formulation comprised of yeast hulls, inert yeast, and other elements critical to viable fermentations. It is appropriate for both initial fermentations and restarting stuck fermentations.
- After years of research, Opti-White is offered as a white wine-offset to the already popular Opti-Red. This Lallemand natural yeast product is added to juice at the beginning of fermentation to improve mouth-feel, inhibit browning, and help protect fresh aromas during wine aging.

Scott Laboratories also offers an array of yeasts, bacterias, nutrients, enzymes, fining agents and lysozyme (from Fordras). Particularly notable from 2003 is the renewed availability of Laffort gelatines.

For more information, please contact:
Scott Laboratories, Inc.
PO Box 4559
Petaluma, CA. 94955
tel: 707/765-6666; fax: 707/765-6674
e-mail: info@scottlab.com;
website: www.scottlab.com

PLEASE SEE SCOTT LABORATORIES ADS, PAGES 18, 85.

Lesaffre Yeast Corporation

Lesaffre Yeast Corporation proudly announces several new yeast-based products for various wine applications:

Red Star® Yeastade Premium: a primary grown, pure yeast extract used to treat specific must amino nitrogen deficiencies.

Red Star® Yeastade 50: a primary grown, partially autolysed yeast, used as a cost-effective general nutrient, combining the benefits of yeast cell walls with partially autolysed polypeptides.

Red Star® Max-Rich Color: a blend that promotes color stability, improves mouthfeel, and reduces wine astringency by binding tannins.

Red Star® Super Starproof: a proprietary blend of yeast fractions containing a high percentage of soluble mannoproteins. This product is recommended for promoting maturation in reds; preventing oxidation in whites; and it can be used to reduce the risk of sulfhydryl compound release during extended lees contact. Super Starproof will provide structure improvement in both reds and whites, even when used as little as one month before filtration. Also, because these benefits derive from soluble mannoproteins, filters won't clog, unlike preparations containing gum arabic.

For more information, contact the distributor,
American Tartaric Products
tel: 707/836-6840; fax 707/836-6843
website: www.americantartaric.com

PLEASE SEE LESAFFRE YEAST'S AD, PAGE 21.

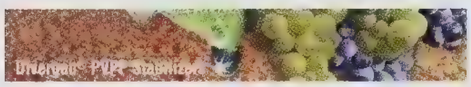
BASF

HELPING MAKE PRODUCTS BETTER™

BASF

BASF's Divergan HM® Polymer and Divergan® PVPP Stabilizer can help you produce better tasting wines with greater clarity.

Divergan HM Polymer is an excellent adsorber of heavy metal ions in alcoholic liquids. It removes the heavy metals that cause turbidity or bitterness — resulting in a purer product with improved taste and appearance. Divergan HM Polymer is approved by the U.S. Food and Drug Administration as a processing aid for removal of unwanted heavy metals. It is safe and simple to use.



Divergan PVPP Stabilizer captures and eliminates polyphenol compounds that cause browning and pinking in finished base and sparkling wines. By adsorbing these compounds, Divergan PVPP Stabilizer helps you produce wines with stable color and smooth taste, retaining clarity and character even after storage.

For more information on Divergan PVPP Stabilizer and Divergan HM Polymer, please contact:

BASF Corporation
3000 Continental Drive-North
Mount Olive, NJ 07828-1234
tel: 800/527-9881; fax: 973/426-5399
email: Divergan@basf-corp.com
Contact: Rolf D. Schmidt
PO Box 1260, Seneca, IL 61360
tel: 815/357-1778; fax: 815-357-6221

Randox Laboratories USA

Winemaking is a science and an art from the vineyard to the laboratory!

The ageing of fine wines has long been considered an acquired art of the vintner, incorporating several processing steps to fine tune the color, taste, mouthfeel, and overall quality of the finished product. Randox offers the following enzymatic kits for use on wine, grape, juice and other similar sample types.

- Acetic acid
- Malic acid
- Ammonia
- Glucose fructose
- Lactic acid
- TAS (Total antioxidant status)

These kits run manually on a simple spectrometer or are adaptable to an automated analyzer. These kits provide quick and accurate results. Randox hopes to expand this range shortly.

RANDOX

Pleasant tasting wines have been enjoyed for centuries and have long been associated with health-giving properties. Recent scientific studies have substantiated the health claims of wine, detailing improvement in clinical conditions ranging from cancer to cardiovascular disease. The health-giving properties of wine have been attributed to chemical components known as flavonoids, the levels of which are also responsible for the quality of the finished product. Randox TAS kit (Total antioxidant status) will help you identify this information to put on your label.

For more information, contact:

Randox Laboratories USA
4065 Oceanside Blvd., Suite Q
Oceanside, CA 92056-5824
tel: 866/472-6369; fax: 866/726-3691
e-mail: randoxus@randox.com;
website: www.randox.com

PLEASE SEE RANDOX LABORATORIES' AD, PAGE 66.

StaVin Incorporated

StaVin's Oak Integration Systems provide *traditional flavor and real economics.* French, Hungarian, and American oak is naturally seasoned for three years and is available in three toast levels. To ensure thorough heat penetration and complex flavors, all oak is traditionally fire-toasted.

On the website, www.micro-ox.com, StaVin discusses how oak and a micro-oxygenation system replicates benefits of winemaking in barrels — within tanks. Also, read how StaVin's fire-toasted oak effectively cross-link grape tannins to build mid-palate structure and stabilize color during red wine fermentation.

Reduce your dependency on barrels for flavor and aging. StaVin's 44 sq.ft. Oak Stave Packs deliver the same traditional flavors as your favorite barrels via three tank configurations: the Tank Modular System, Tank Matrix, and the new Tank Stave Fan system.

StaVin's French, Hungarian, and American Oak Beans, and French Oak Stave Segment are versatile and cost-effective systems, packaged in food-grade nylon bags, for imparting oak flavor within tanks.

Impart neutral barrels with the complexity and quality of new oak barrels. Use StaVin's Oak Barrel Replica, Traditional Barrel Insert (now available in a new barrel extraction level.), and Infusion Tube.

For more information, contact:

StaVin Incorporated
Alan Sullivan, Steve Sullivan,
Dr. Jeff McCord, Jamie Zank
PO Box 1693, Sausalito, CA 94966-1693
tel: 415/331-7849; fax: 415/331-0516
e-mail: info@stavin.com;
website: www.stavin.com

PLEASE SEE STAVIN'S AD, PAGE 24.

Glass Pak®

domnick hunter, a 40-year-old company, has joined with *Glass Pak®* in Fairfield, CA, to supply membrane filters, pads, housings, and technical support to the wine industry in California, Oregon, and Washington. Aaron Mosley, veteran winemaker, will come to your winery to assist with any filtration problems that arise, usually with immediate diagnosis.

Glass Pak® is also supported by *domnick hunter's* technical center in Charlotte, NC, which is available for filter analysis as part of the service. *Glass Pak®* supports this program with on-hand inventory and same day shipment.

For more than eight years, *domnick hunter* membranes have been made with PES (polyethersulfone), a membrane material that has a molecular structure providing better flow rates at lower differential pressure. PES is now being promoted as "new technology" by other filter suppliers. *domnick hunter* final membranes are fully validated and 100% integrity-tested prior to shipment.

For more information, contact:
Glass Pak®
Dallas Nelson
5000 Fulton Dr., Fairfield, CA 94534
tel: 707/207-0400; fax: 707/207-0900
e-mail: gpfilters@aol.com

PLEASE SEE GLASS PAK'S AD, PAGE 50.

Maurivin Yeast

Since Maurivin's introduction to the California wine industry 10 years ago, the Australian-made wine yeast has built a reputation for high quality, reliability, and competitive pricing.

The Maurivin range of wine yeast is manufactured by the global yeast producer Burns Philp & Co. Ltd., at its ISO/HACCP certified operation in Toowoomba, Australia. Production at this facility first began with the popular Australian Wine Research Institute strains. With the rapid global demand for these high-quality yeast, Maurivin expanded its range, which now encompasses 13 different yeast applicable for all winemaking styles.

This range includes PDM, the industry's "workhorse" yeast; AWRI 796, Maurivin's most popular strain for varietal white and red winemaking; and other well-known strains such as EP2 (Epernay), UCD-522 (Montrachet), Primeur, and Sauvignon L3.

Recent additions to the Maurivin range include Elegance, a yeast ideal for fruit-driven varietal whites fermented at cooler temperatures, and BP-725, used commonly for the "big reds," such as Syrah and Zinfandel.

Burns Philp is proud to be a major supplier of wine yeast to the U.S. wine industry and looks forward to continuing its close working relationships with customers and distributors alike.

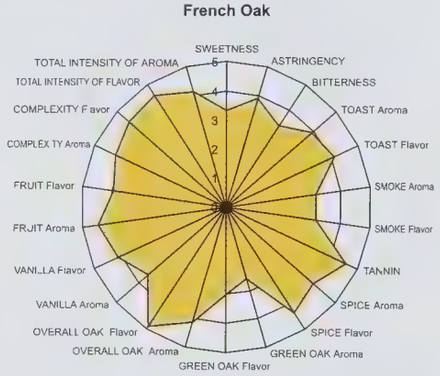
maurivin™

For more information, contact:
Maurivin Yeast
Burns, Philp and Co. Ltd.
Nick Yap
Cell: +61 412 213 305
e-mail: nicholas.yap@burnsphilp.com;
website: www.maurivin.com

PLEASE SEE MAURIVIN YEAST'S AD, PAGE 16.

World Cooperage

Winemakers continually strive to find the right oak for their different varietals and diverse programs. That's why World Cooperage now offers an extensive library of sensory profiles for its toasted tank staves. By partnering with oak maturation expert Dr. James Swan, the cooperage also provides custom flavors by defining the optimal toasting time, temperature, and method. Unlike other suppliers, Dr. Swan verifies results using sophisticated and tailored analysis methods, such as HPLC and GCMS.



Most oak alternative suppliers give you a limited number of choices. With World Cooperage, options are endless — convection toasting or infrared toasting plus time and temperature variables.

Additionally, the fourth-generation company introduced Premium Dark Roasted Oak Chips this year, which contribute an intense flavor with pronounced spiciness, caramel, toffee, and chocolate. This premium chip has darker flavors than the standard chip and is recommended for red wines. This product is the latest addition to the portfolio that includes toasted oak powder, classic chips, granular oak, high vanilla chips, tank staves, and barrel renewal systems.

To personalize your own alternatives or request additional data, contact:
World Cooperage
Paul Abbott, Oak Alternative Specialist
2557 Napa Valley Corporate Dr., Suite D
Napa, CA 94558
tel: 707/255-5900; fax: 707/255-5952
e-mail: info@worldcooperage.com;
website: www.worldcooperage.com

PLEASE SEE WORLD COOPERAGE OAK ALTERNATIVE ADS, PAGES 13, 21.

Lallemand

Lallemand produces over 180 different yeast and malolactic bacteria cultures for the international winemaking community. For over 25 years, its commitment to research and development in the area of winemaking fermentation continued to be Lallemand's primary goal.

Encapsulated Yeast — Lallemand, in collaboration with Proenol, has perfected the technology of immobilizing yeast in alginate beads. The technique of encapsulating yeast cells enables the substrates and metabolites to diffuse throughout the gel without releasing saccharomyces cells into the must or wine. Encapsulated yeast are used for completing a stuck fermentation, or for making high quality residual sugar wines.

Bacteria — Direct inoculation cultures Lalvin 41 and Enoferm Beta are the newest ML cultures being offered, that work under difficult conditions and have specific sensory contributions such as increased mouthfeel.

Nutrients — Primary fermentation nutrients include the popular Fermaid and Go-Ferm brands. The product line continues to evolve and recommendations are updated to keep up with the growing number of exciting breakthroughs from Lallemand laboratories and partner universities and institutes throughout the world.

Opti-Red and Opti-White are used at the beginning of fermentations to obtain fuller bodied, more color stable, smooth palate wines.

Contact Lallemand for assistance in choosing the best fermentation tools suited to your resources and stylistic goals.

For more information, contact:
Lallemand
Gordon Specht
PO Box 5512, Petaluma, CA 94955
tel: 707/526-9809; fax: 707/526-9803
e-mail: gspecht@lallemand.com
website: www.lallemandwine.com

PLEASE SEE LALLEMAND'S AD, PAGE 30.

Lodi Winery Laboratory

Lodi Winery Laboratory is an independent wine-testing laboratory opened in 2002 to meet the needs of growing wineries and home winemakers. Services include winemaking supplies, analysis, and technical consultation. Winemaking supplies include:

- Cellar chemicals: tartaric and citric acid, bentonite, and cleaning chemicals;
- Yeast and malolactic bacteria;
- Lab chemicals including indicators and titrants for standard lab analyses;
- Lab equipment, such as pipets, beakers, hydrometers, burets, pH meters, and supplies;
- Winemaking equipment including thieves, bungs, Better Bottle carboys, and refractometers.

LWL
LODI WINERY LABORATORY
SALES AND SERVICES

Lodi Wine Lab can ship or deliver your order and online ordering is available. Please call 209/339-1990 to have questions answered and for further details. The Lab is open Monday through Friday, 9:00 AM to 5:00 PM.

For more information, contact:
Lodi Winery Laboratory
Sandi Walker-Tansley
400 E Kettleman Ln., Ste. 19, Lodi, CA 95240
tel: 209/339-1990; fax: 209/339-1975
e-mail: lwl@lodiwinerylaboratory.com;
website: www.lodiwinerylaboratory.com

Innerstave LLC

"Shaping the taste of fine wines" has been the most fulfilling activity for more than 22 years at Innerstave, originator of the barrel insert.

Winemakers appreciate Innerstave because of its non-invasive, no welding, cleanable design. Little effort is required of cellar staff because Innerstave is installed for free by its own qualified coopers.

Innerstave's highest acclaim is for its award-winning flavors found in wines of all price ranges, including ultra premiums.

The supply of on-site, air-dried French and American oaks ensures availability of high-quality, seasoned oak for every order. Winemakers can use Innerstave to manage and control wine-to-wood ratios, oak type, and toast levels. Most find that using Innerstave allows them to reduce winemaking variables and better predict finished wine flavor. The use of Innerstave at any time during the wine's life gives winemakers better control of a wine's character.

Innerstave's "OakPLUS" oak chips have been a flavor benchmark for oak chips used in wineries. The low-dose, high-flavor impact of these chips makes them one of the most requested chips in the industry.

For winery-friends who have small lots of wine or are far away from Innerstave's home in Sonoma, CA, Innerstave offers Chain O' Oak, a self-install alternative to new barrel Innerstave.

Innerstave guarantees satisfaction in everything it does!

For more information, contact:
Innerstave, LLC
Scott Gill
24200 Arnold Dr., Sonoma, CA 95476
tel: 707/996-8781; fax: 707/996-1157
e-mail: scott@innerstave.com

Atago USA Inc.

ATAGO is celebrating over 60 years of manufacturing and design of reliable, accurate, and dependable refractometers for the winemaker, vineyard owner, and grapegrower. ATAGO products are ISO 9001 certified, and used in over 100 countries worldwide.

ATAGO's new "Pocket" PAL-1 combines the latest technology with innovative design to produce a low-cost, easy to use, handheld digital refractometer. Used to measure the Brix % of grapes and other fruits and vegetables, this refractometer is quickly becoming ATAGO's most popular item with over 20,000 sold worldwide since its release in June 2003.

Widely used in the grape and wine industry, the PAL-1 features a digital display, automatic temperature compensation from 10° to 60°C, and the ability to be washed under running water (highly water-resistant). These features eliminate the difficulty of reading an analog scale, the need for temperature conversion charts, and repeated repairs due to the ingress of water.

For quality wines use a quality refractometer. The PAL-1 is the "Next Generation Refractometer" priced to fit any budget, only $295!

For more information, purchasing details, or to request a demonstration unit, contact:

Atago U.S.A., Inc.
13005 NE 126th Place
Kirkland, WA 98034
tel: 877/ATAGO-USA; fax: 425/825-5525
e-mail: wine@atago-usa.com;
website: www.atago.net

PLEASE SEE THE ATAGO U.S.A., INC. AD, PAGE 42.

GusmerCellulo Company

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PLEASE SEE GUSMERCELLULO'S AD, PAGE 28.

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Vintners Supply announces the release of the new Clearflow 0.8 micron double layer, pleated, cartridge filter. Vintners Supply is the exclusive West Coast distributor for PTI Advanced Filtration, Inc., products for the wine industry.

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PLEASE SEE VINTNERS SUPPLY'S AD, PAGE 58.

Nadalié

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Enviro Tech Chemical Services Inc.

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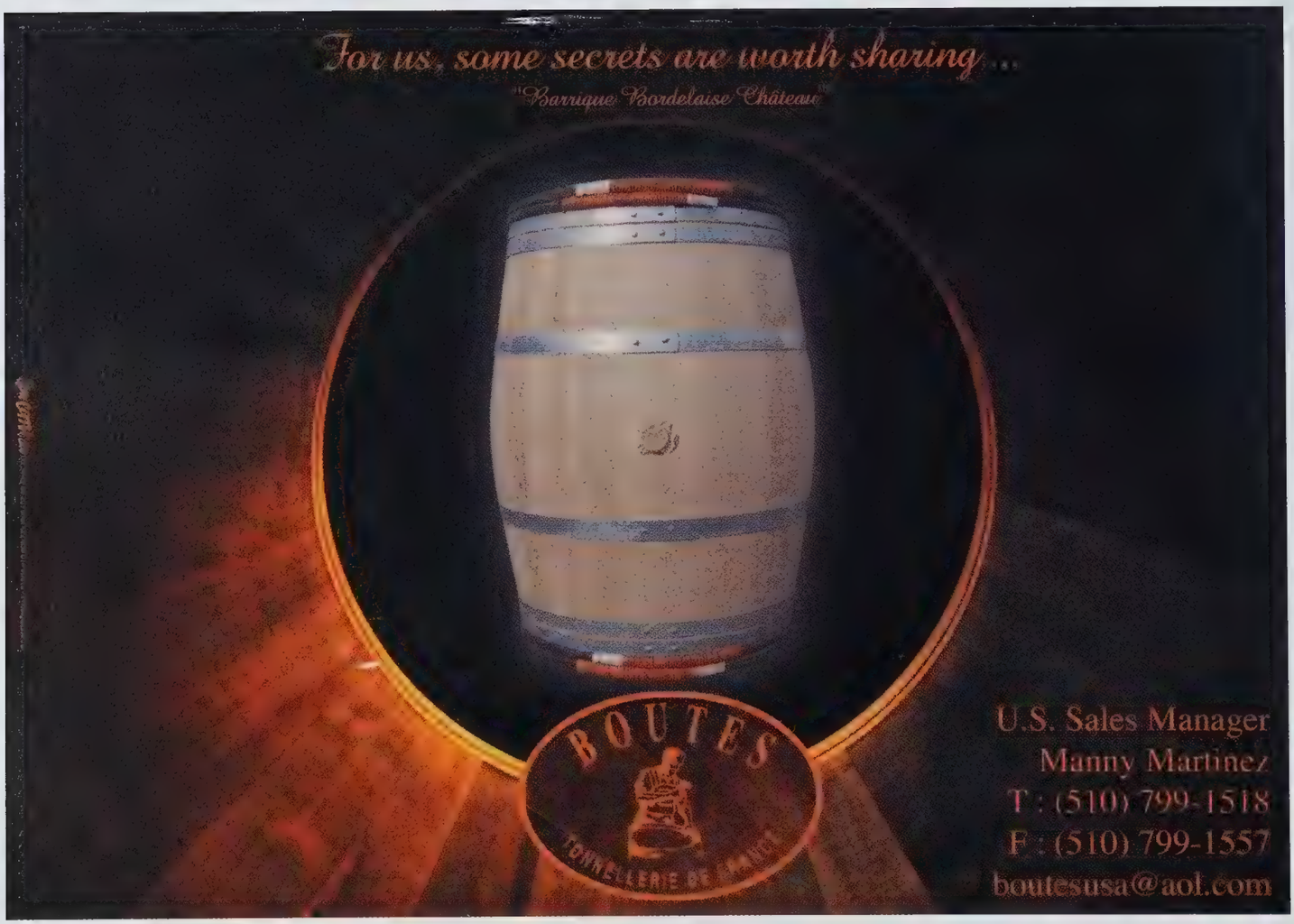

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2003 SAN SIMEON EARTHQUAKE

Lessons learned on the faultline

BY Joshua Marrow, PE

At 11:15 AM, December 22, 2003, a magnitude (M) 6.5 earthquake struck the central California coast. Less than four years after the M5.0 Yountville earthquake in northern California, it reminded the wine industry yet again that earthquakes are not only a recurrent fact in California, but they are often devastating.

The epicenter of what became known as the "San Simeon" earthquake was located about midway between San Francisco, some 200 miles to the north, and Los Angeles to the south. Seismicity in the region is dominated by the San Andreas fault, which passes about 30 miles east of Paso Robles.

The San Andreas fault was the source of great earthquakes in northern California in 1906 and southern California in 1857. The earth's crust in the Central Coast wine region is highly stressed with many small faults present. The December 22 earthquake occurred along one of these smaller faults, the Oceano fault, which underlies the coastal range of hills that defines the Paso Robles/Highway 46-west wine region.

Although the earthquake was of relatively large magnitude, comparable to the M6.7 1994 Northridge earthquake, it was located in a sparsely populated region, and thus produced only moderate effects to the community as a whole.

The region is dotted with some 110 small-to-medium production wineries, sparse residential properties, and a few population centers, including Paso Robles (population 26,000) 24 miles east of the epicenter, Templeton (5,000) 24 miles southwest, and San Luis Obispo (45,000) 40 miles to the south. Due to the relatively high density of wineries in the region, the wine industry sustained more damage than any other local industry.

Lessons learned and relearned

Of the wineries in the affected region, about 75 sustained damage to building contents, 40 of these experienced damage to wine barrel stacks, tanks, and or case goods. None suffered structural damage to winery buildings.

No deaths were reported in a winery, though one employee at Wild Horse Winery narrowly escaped catastrophe with only a broken rib when she remained in the forklift as barrel stacks collapsed around her. Her life was saved by the forklift's robust steel rollover protection — and her apparently intuitive sense of seismic safety.

Winery buildings

Winery construction in the region varies from early 1900s un-reinforced masonry (both retrofitted and not) to modern timber-frame, steel-frame, and concrete tilt-up structures. Despite the heavy damage to winery contents, none of the wineries reported significant structural damage that would restrict occupancy or limit function. No wineries I visited after the earthquake had even slight cracking to the interior or exterior architectural finishes.

Winery contents proved to be significantly more vulnerable to damage than winery buildings, with the majority of financial loss and threat to safety due to content toppling. As the ground motions at these regional wineries

Stacks of barrels only three levels high collapsed at this winery, defeating the notion that lowering the stack heights will prevent collapse.

were not strong enough to cause even minor damage to the brittle building finishes, it is especially disconcerting that the contents suffered such enormous damage under this moderate level of ground shaking.

Wine barrel storage

The greatest amount of financial loss and business interruption to the wineries was due to toppled and damaged wine barrels. Our observations of how those barrels had been stored revealed the following significant findings:

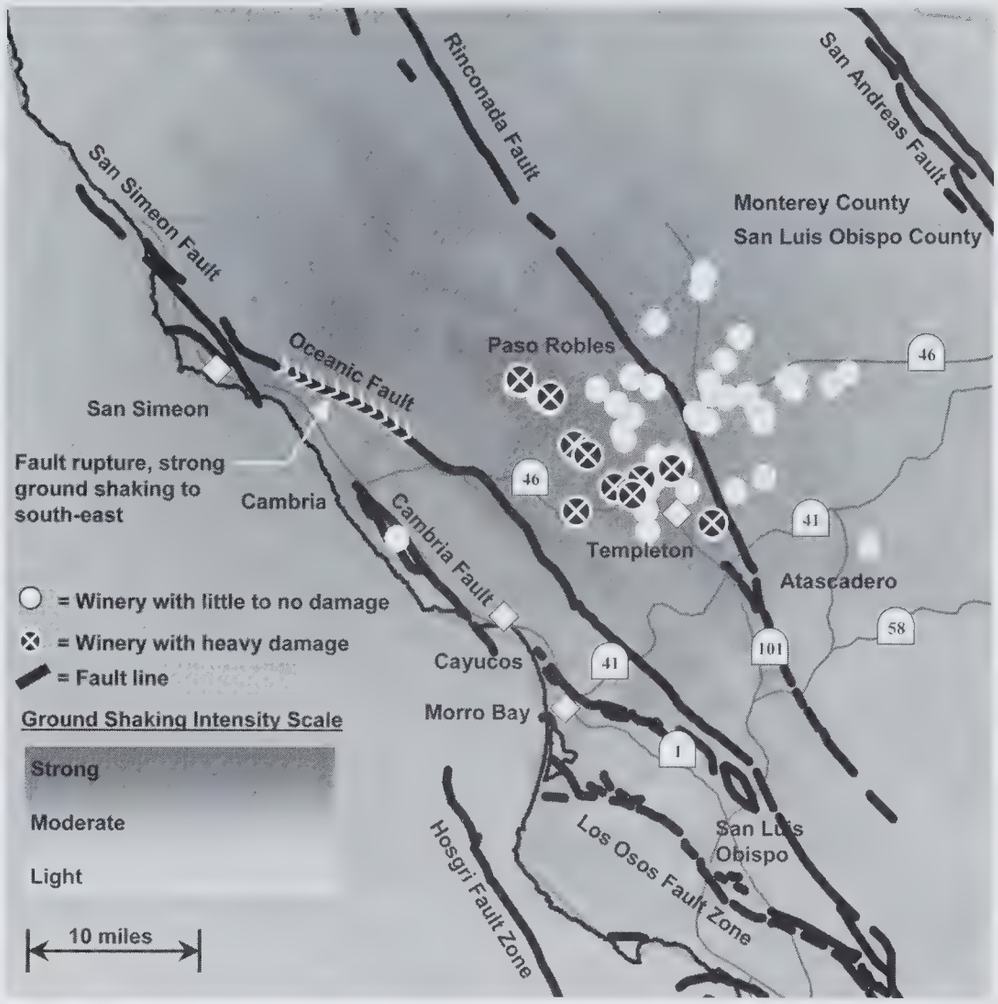
At many wineries located off Highway 46-west, stacks of barrels on two-barrel racks collapsed due to rack-walking and sliding. Stacks of all different heights collapsed due to this behavior, not just the taller stacks as generally assumed by the wine industry and earthquake researchers who have studied the subject. This behavior is just as previously observed during wine-industry-funded experiments at UC Berkeley and during the 2000 Yountville earthquake.

The most surprising observation was of how many shorter barrel stacks experienced collapse and damage, negating the popular belief that merely lowering the stack height would ensure that barrel stacks would not topple in an earthquake. (This was also the general opinion of the author prior to this earthquake.)

Barrel racks at Mastantuono Winery, off Highway 46-west, were stacked three-high and toppled due to rack sliding and walking. Just across the street, Turley Wine Cellars experienced the same sliding and walking responses on its stacks of five- and six-barrels high.

In general, all two-barrel racks, regardless of manufacturer, exhibited essentially equivalent earthquake performance. Many of these facilities use a variety of different rack styles and manufacturers, making it difficult to draw any significant correlation between damage and a specific rack manufacturer.

Stack toppling patterns observed at the most heavily damaged wineries



Map showing ground shaking intensity (severity) in December 2003 San Simeon earthquake near Paso Robles.

indicated that the orientation of the barrel stack to the strongest direction of earthquake ground shaking affected the stack's ability to withstand the shaking. In general, stacks of two-barrel racks oriented with the barrel length perpendicular to the strong ground shaking endured the ground shaking better.

Wine loss and overall barrel damage were limited at Turley Wine Cellars because heavy masonry walls confined the stacked barrels on three sides. The barrel stacks collapsed to the south, toward the only open space near the doorway. The walls on the remaining three sides prohibited barrels from falling all the way to the cellar floor.

A building constructed with light metal walls may not have the capacity to resist the toppling barrels and would likely experience more barrel and wine loss than observed here.

In general, barrels stacked in tight configurations (with heads and or bilges touching between adjacent stacks) experienced toppling just as extensively as loosely stacked barrels. This finding is significant because the industry generally assumes that more tightly packed barrels provide more security against stack toppling.

The only benefit to tighter packing that could be observed from this earthquake is the limited open room for barrels to fall after the stack topples. This confinement could minimize direct losses of wine but does not ensure the stacks will not collapse.

Two-barrel racks resting on the steel hoops of barrels underneath experienced sliding more often than racks resting on wood staves of barrels

beneath. This confirms the previous consensus that the wood-to-metal contact provides higher friction resistance against sliding, thereby improving stack stability.

Four-barrel racks performed better than two-barrel racks, although one-to-one performance data cannot be established because no wineries in the region of heavy ground shaking were using four-barrel racks. Wineries using four-barrel racks were located along Highway 46-east, further away from the strong ground shaking. None of the wineries in the Highway 46-east region reported any significant damage to contents or buildings.

Barrels chocked in a three-high pyramid configuration at Dover Canyon Winery experienced damage as the barrels worked loose and collapsed. In many past earthquakes, pyramid stacks have proven to be quite vulnerable to collapse as the chocks work loose, causing the entire stack of barrels to topple or roll out.

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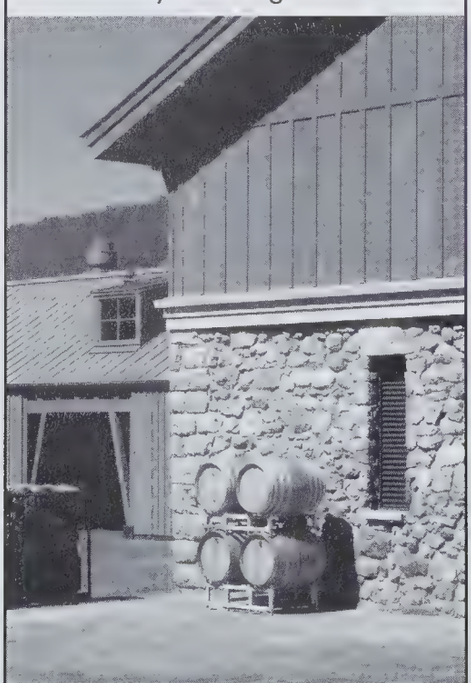

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Recommended wine barrel stack mitigation

Barrel damage can be mitigated somewhat by lowering stack heights, thereby reducing the height from which barrels fall. Lowering the stack height, as observed in this earthquake, does not necessarily ensure the stack will not topple.

Observations from a variety of wineries indicate that every stack height is vulnerable to collapse due to rack sliding and walking. Lowering stack heights merely reduces the fall distance, minimizing the potential for direct losses.

The near miss at Wild Horse Winery proves that there is a need for supplemental protection in barrel rooms to protect personnel from falling barrels. Forklift rollover protection provides an excellent safeguard against falling wine barrels. All forklifts should be fitted with rollover protection cages. This is now a basic OSHA requirement, and all new lifts come standard with rollover protection.

Pre-built, forklift-able "safety cages" are an option to provide transportable safety areas. The cages can be placed on the cellar floor at various locations throughout the barrel room, based on the areas of heaviest operation throughout the season. If an earthquake were to occur in the future when personnel are working in the barrel room, they could run to safe cover within a safety cage and may avoid serious injury from falling barrels.

Barrels should not be stored where collapsed stacks may block means of access and egress to the warehouse, promoting a serious safety risk post-earthquake. Accordingly, every winery should develop a set of written provisions for dealing with toppled stacks and damage to other winery operations. These provisions should be developed with the specific facility in mind and should identify all entry and exit points that may be blocked and alternative means to exit the facility following the earthquake.

This barrel, destroyed in the earthquake, was pulled from the bottom of a pile of collapsed stacks on two-barrel racks. Under extreme pressure or impact, a wine barrel will generally blow out the heads before the staves or hoops give way.

Collateral damage due to collapsed wine barrel stacks can be minimized by the use of bulkheads, removable bollards, or other means of protecting personnel working around the barrel stacks, adjacent equipment, and wine tanks, for example. Confinement provided by these options will also compartmentalize the damage (as observed at Turley), minimizing the logistics of barrel recovery.

Buildings should be designed with sufficient strength to resist loads due to barrel stacks leaning against the walls. Currently, buildings are not designed with this provision unless explicitly requested by the owner and accounted for by the structural engineer. Additionally, redundant exits should be provided in all new barrel rooms — more exits than the building code currently requires for buildings of this occupancy category.

Stainless steel tank design considerations

Anchored tanks performed well in previous earthquakes, while unanchored tanks experienced slight shell buckling and shifting, causing valves and rigid fittings to break and leak. Poorly anchored tanks performed as

Heavy masonry wall on three sides of Turley Wine Cellars' barrel room confined barrels and limited damage because barrels could not fall all the way to the cellar floor.

inadequately as unanchored tanks, reaffirming the need for properly designed tank anchorage systems.

Unless a winery specifically requests new tanks to be designed for hydrostatic (fluid pressure) *and* an earthquake, a tank manufacturer will not automatically construct a tank to these criteria, even when tanks are installed in a region of high seismicity.

The 1998 California Building Code (CBC) requires all thin-walled tanks to be designed to withstand lateral forces due to earthquake and wind, or alternatively, the tank can be designed to a nationally recognized tank design standard. The current national standard for stainless steel tank design (published by the American Water Works Association) does not regulate mandatory seismic design criteria for tanks installed in regions of high seismicity, and the seismic design criteria contained in this standard is less stringent than the 1998 CBC.

Current tank design codes do not require seismic design in high seismic zones and local building departments do not regulate the issue. Since wine tank manufacturers do not offer seismically configured tanks due to price-competition, it is the *sole responsibility* of a winery and its engineering consultants to ensure sufficient tank design and anchorage installation.

Additionally, the anchors that come pre-installed on tanks are not generally designed for earthquakes; they are typically for transportation anchorage and wind loading only. Tanks anchored permanently with these steel tabs are likely to fracture the anchorage during ground shaking, or worse, tear the tank wall at the base, causing an unstoppable high-pressure wine leak.

Warehoused case goods

In the San Simeon quake, there were no post-quake reports of collapsed palletized case goods. Shrink wrap proved to be an extraordinarily effective method of confining and protecting palletized bottled wine on storage racks. Some wineries experienced damage to individual cases, not shrink-wrapped, that were stacked on storage racks or pallets.

This finding clearly indicates that all case goods should be shrink-wrapped to best withstand earthquake damage. Even if case goods do collapse in an earthquake, the cardboard boxes and shrink-wrap will absorb a tremendous amount of energy, limiting damage to bottles inside.

The most significant vulnerability of case goods is broken fire sprinkler pipes. If the fire suppression system is not adequately braced, the pipes will break at numerous rigid joints, spilling water all over the warehouse floor. The case goods will soak up water, softening the cardboard and, ultimately, collapsing the stacked goods.

Hospitality facility/ wine library protection

A significant majority of wineries in the region sustained damage to tasting rooms and wine libraries. Although the damage was messy, resulting in significant cleanup time and closure of tasting facilities to tourists, the financial losses were relatively low. Fortunately, the earthquake occurred during the holidays, when tasting rooms were not very busy.

Hospitality personnel should have proper emergency response training on procedures following an earthquake. Wine bottles in displays behind the tasting bar can come crashing down on personnel working during an event.

Hospitality staff should know how to react when there is an earthquake, including getting away from fragile falling objects and ensuring any guests in the tasting room know how to get out of the building once an earthquake ends. Every winery should build these procedures into a comprehensive Earthquake Response Plan.

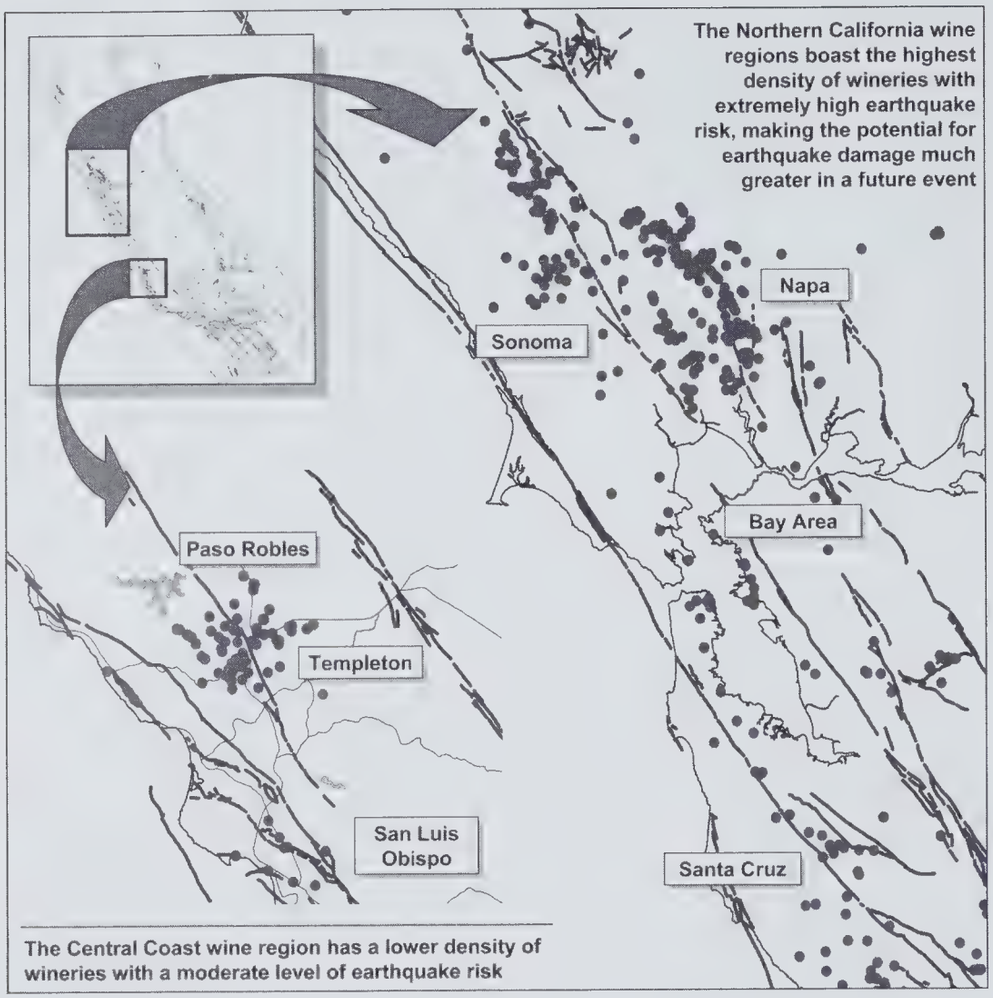
Making a response plan

The San Simeon earthquake occurred during the least active time of the winegrowing season, making it a "best-case" scenario for an earthquake impacting this industry. The wine industry is unique in that it is an agricultural industry with a structured annual schedule for processing and ageing, with vulnerability to seismic activity varying significantly throughout the year.

The big lesson learned in this earthquake is that the time of year an earthquake occurs is critical to a winery's ability to respond and recover. Had this quake occurred during or just prior to the harvest season, the financial loss and threat to life would likely have been exponentially higher. Every winery thus needs to develop a post-earthquake response and recovery plan in order to adequately recover assets and keep business operations moving.

Disaster planning is the key to recovering inventory and ensuring minimal business interruption. If your winery is located in a densely populated wine production region, the demand for recovery and operations equipment will be high and thus may not be available to your winery following the event.

Every winery should establish agreements with local equipment sup-


The Northern California wine regions boast the highest density of wineries with extremely high earthquake risk, making the potential for earthquake damage much greater in a future event
Napa
Sonoma
Bay Area
Paso Robles
Templeton
San Luis Obispo
Santa Cruz
The Central Coast wine region has a lower density of wineries with a moderate level of earthquake risk

pliers (tanks, barrels, propane and gas generators, pumps, and so on) to ensure immediate access to equipment following an earthquake. It is important to identify who within your organization is authorized to bring in support after the earthquake and who is authorized to approve funds for earthquake damage recovery.

An agreement with a structural engineer should be established in advance to ensure rapid inspection of facilities following an earthquake. Structural engineers are in great demand after an earthquake, and if an agreement is not already in place, your winery may not have the resources to retain one for rapid inspection of your facilities.

It is also important to note that key winery personnel will typically exercise personal priority immediately after the earthquake, tending to the welfare of their family and home. This reality makes it even more important to establish a relationship with an engineering professional who is trained to respond to the disaster in a more timely fashion.

As an essential backup, wineries should form mutual agreements with wineries outside the affected region to ensure continued production capacity.

Yountville and Loma Prieta lessons

The M6.5 San Simeon and M6.9 Loma Prieta earthquakes were 180 and 710 times the size of the M5.0 Yountville earthquake, respectively.

The Loma Prieta quake demonstrated the vulnerability of thin-walled stainless steel tanks, both anchored and unanchored. Many wineries suffered extensive damage to tank inventories and associated process piping systems. Barrels stacked in pyramids also suffered significant damage.

The less intense Yountville quake proved to many wineries that wine barrels stacked on top of two-barrel racks perform poorly in earthquakes. Unlike wineries affected by the Loma Prieta quake, many Napa Valley wineries were using portable steel barrel racks extensively. Had the Yountville earthquake shaken for slightly longer, the majority of the shifting barrel stacks would have collapsed, leaving a mess of extraordinary proportion compared to the reported San Simeon quake damage.

Wineries throughout seismically active regions of the U.S. should learn from these earthquake observations and take the appropriate steps to improve earthquake safety in their facilities. ■

Joshua Marrow is a California-licensed consulting structural engineer with Simpson Gumpertz & Heger Inc. in San Francisco. He is also a California Office of Emergency Services (OES) Certified Disaster Inspector, a frequent member of the Earthquake Engineering Research Institute's (www.EERI.org) multi-national post-earthquake investigation teams, and president of Vingenuity Inc., a San Francisco-based wine industry seismic protection company. He can be contacted at 175 Bluxome Street, #325, San Francisco, CA 94107, tel: 415/543-5439, fax: 415/651-8799, www.vingenuity.net.

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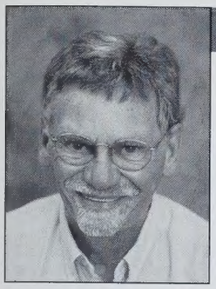

SMART VITICULTURE *by Dr. Richard Smart*

SYRAH DISORDER

New worry for California vineyards?

I have been aware of a Syrah disorder on the Central Coast region of California for a number of years now, long before the concern arose about the more widespread symptoms that appeared in 2003.

Having extensive experience with Syrah in Australia (where it is more commonly called Shiraz), France, and South Africa, I would like to offer a personal perspective on this disorder, which I hope might help local viticultural experts more quickly identify the problem and seek some remedies. This is not to suggest that I have the problem solved, but I hope my observations and experience might be found useful.

I am aware that the disorder has been discussed at several meetings recently, which I have been unable to attend. Of particular interest was a recent discussion at the 7th Annual Central Coast Viticulture and Enology Issues Conference on Syrah, hosted by Fresno State University at San Luis Obispo, February 26–27. Local University of California Cooperative Extension Farm Advisor Mark Battany and consultants and growers discussed the problem.

Recent history and symptoms

A recent article by James Stamp in *Wine Business Monthly* (February 2004) indicates that Syrah Disorder was first noted in 1999 on the Central Coast. Since Syrah is a relatively new variety, many of the vineyards showing symptoms are young.

In 2003, symptoms appeared in many vineyards where they had not previously been evident. This included vineyards to the cooler south. Symptoms were reported in many Santa Ynez vineyards for the first time, affecting perhaps 5% of the blocks. A survey carried out in 2003 by Mark Battany was published in *Grape Notes,* December 2003.

The symptoms are relatively conspicuous. The first obvious sign is leaf reddening, which occurs around veraison. Whole leaves turn red, and generally veins do not remain green as they do in Leaf Roll Virus. Leaves may subsequently develop a burnt appearance. In the following season, growth can be restricted.

I have seen, on several occasions, dead vines among those showing symptoms. Stamp (2004) and Battany (2003) state that vine death associated with symptoms is yet to be confirmed in California, but I think this is only a matter of time. Fruit ripening is slowed, which can be measured by fruit sugar content. Fruit coloration is also slowed. One of my clients went so far as to make wine from affected vines, and the result was of very poor quality.

Wood ripening is also delayed, and canes in autumn show large amounts of white or pink tissue without the characteristic brown periderm (bark) tissue. Sometimes these canes will appear black if soft and unripened tissue is killed by frost. Note that dense canopies and excessive crops can also delay wood ripening, but not to the same extent.

Affected vines are typically spread throughout the vineyard, with little apparent pattern. However, as the disorder develops, it does appear to spread to adjacent vines in the row and, to a lesser extent, across the row. In subsequent seasons, bud break is reduced, along with vegetative growth. I believe vine death can follow.

The condition does appear to be predisposed by other factors, especially vine water stress. Many people propose that the condition is an effect of nutritional imbalance, but to my mind this is often wishful thinking. In the vineyards where I have seen the disorder, there are no other symptoms of nutritional problems.

The symptoms above are consistent with blockage of the vines' conducting tissue, which I suspect is the primary cause. Stamp (2004) records differences in K and Mg levels between symptomatic and non-symptomatic vines. This, however, cannot be taken as the cause of the disorder. In my opinion, K and Mg differences are likely a consequence of impeded movement in the vine.

Syrah is the variety reportedly affected by the disorder. However, I have seen Merlot vineyards to the north of Paso Robles showing identical symptoms. Adjacent vineyards of Cabernet Sauvignon, however, show no symptoms. Such variety-specific disorders are quite rare in viticulture. Symptoms appear worse in vines under water stress and can be lessened by severe crop thinning.

Mark Battany surveyed 139 local growers and received 44 replies. (See page 20 for a full account.) The survey showed very interesting results. The disorder was more frequent in warmer rather than cooler parts of the Central Coast, and vine age had no apparent effect on symptom expression, with both old and young vines equally likely to show symptoms.

The disorder was reported on seven clones and all rootstocks. However, there were more symptomatic vines on SO4 and 5 BB and fewer on 110R, 140 Ru, and 1103P. Symptoms also occurred on own-rooted vines. The disorder was more likely to be found on vines planted to non-certified material, but could also be found on certified material.

Possible causes

I have discussed this problem with many growers over many years. Most are inclined to seek a physiological explanation, particularly involving water or nutrition. I doubt that such explanations are satisfactory.

In Australia, we have had over 170 years of experience growing Shiraz over a wide range of soils and climates. Currently there are about 40,000 hectares of the variety, both grafted and own-rooted. Many of these vines have experienced water stress, sometimes nutrient stress.

Let me state categorically that Shiraz is no wimp. Indeed, it is among the hardiest varieties, especially for water stress. We would expect this given its French origin in the dry Rhône Valley. Many of Australia's ultra-premium Shiraz wines are grown from very water- stressed vines.

Significantly, I have not seen symptoms of the French Syrah disorder called "Syrah Decline" in Australia nor in other parts of California where Syrah is grown under water stress! While water and/or nutrient stress may predispose

the condition or exacerbate symptom expression, I do not think this is the cause. Further, such stresses do not normally kill vines.

Stamp (2004) and Battany (2003) discuss French Syrah Decline. This decline is more often present in older vineyards but has only recently been described. Symptoms are similar to those described above, but vine death is commonly recorded.

Other common symptoms are cracked, swollen, and grooved graft unions. Current thinking in France is that the decline involves defective graft unions. I have not seen a disorder like this in Australia apart from a few vines. There are now many thousands of hectares of grafted Shiraz in Australia.

Might the French Syrah Decline be the same as Syrah Disorder the Central Coast? Perhaps, but in my opinion, it is most unlikely. I have checked graft unions on many symptomatic vines and failed to find any swelling or grooving.

Stamp (2004) reports a survey conducted by Dr. Deborah Golino of Foundation Plant Services at UC Davis in 2002 (see page 20). This survey covered a range of locations, clones, and rootstocks. Stamp's report did not cover the effect of vineyard location.

There was no obvious pattern among the other factors and presence of symptoms. The virus organisms known to be involved with graft union disorders were generally absent, and presence of virus did not correlate with symptoms, although some symptomatic vines showed evidence of an unknown virus.

Golino came to the conclusion that cultural and management issues may be involved with Syrah Disorder in California. The relationship to French Syrah Decline might be tenuous, since Golino reports that graft unions of symptomatic vines were normal.

Stamp (2004) writes of an "Australian Shiraz Disease." I have never heard of it. There is an unknown condition in Australia called "Restricted Spring Growth," which mostly affects Chardonnay in hot areas. It is often associated with phytoplasma infections and sometimes with bud mites. Shiraz can be infected with Grapevine Virus-A, which can cause retarded spring growth, but this infection is not widespread in Australia.

Shiraz Disease in South Africa

I heard of Shiraz Disease on my first visit to South Africa in 1988, and it immediately caught my attention because of its possible implications for Australia. At that time, virologists at the Fruit, Vine and Wine Research Institute, Nietvoorbij, Stellenbosch, were speculating that the disease is caused by a virus complex. The present researcher is Dr. Rolleen Carstens. (See http://www.wynboer.co.za/recentarticles/0399shiraz.php3.)

Shiraz Disease is known to be graft-transmissible, *and natural transmission has been reported.* GVB, one of the leafroll complex of viruses, has been shown to be spread by mealy bugs in South Africa. Natural spread of leafroll virus is an economically important issue in South Africa, and ant and mealy bug control are being studied.

Shiraz Disease affects Shiraz, Merlot, and Malbec. As more Shiraz is being planted, the disease is becoming more prevalent. It has been found that grapevine leafroll-associated virus-3 GLRaV-3, one of the viruses of the leafroll complex, is often found in material infected with Shiraz Disease, along with sometimes GVA and GLRaV-1, and GLRaV-2. Concerns have been expressed about the sensitivity of detection.

Symptoms of Shiraz Disease include reddening of leaves, poor fruit coloration, delayed maturity, and poor maturity of the canes. Bud break is delayed, vegetative growth is poor, there are fewer bunches, and the bunches set poorly. The causal agents can be eliminated by a combination of thermotherapy and tip propagation.

Stamp (2004) dismisses the possibility that Shiraz Disease is linked to the Syrah Disorder of California, without apparent justification. He feels that French Syrah Decline and Californian Syrah Disorder are more likely related, an opinion I do not agree with. It seems to me that there are many similarities between South Africa's Shiraz Disease and Californian Syrah Disorder.

What can growers do?

It seems to me that there are more unknowns than knowns at this time in California. I urge my grower clients to mark vines to better understand what is going on in their vineyards. An important issue to study is whether the disease is spreading, and what may be the responsible agents — likely insects.

I suggest that blocks of five to 10 rows be marked in affected vineyards. Mark the vines with tape or colored spray paint, using a different color at each inspection. First mark vines with delayed bud break, then vines with colored leaves at veraison, then vines with poorly colored fruit just prior to harvest.

After harvest and at leaf fall, pass through the block again, marking vines with lots of poorly matured wood. Repeat for at least one year. The results can be mapped, and the grower might try to modify nutrition or water supply to relieve symptoms (though I doubt that this will be very successful).

Conclusion

There are several similarities between Californian Syrah Disorder and South African Shiraz Disease. Attention to this fact might open up fruitful areas of collaboration and research. I would list the following:

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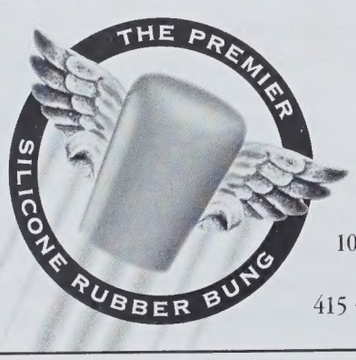

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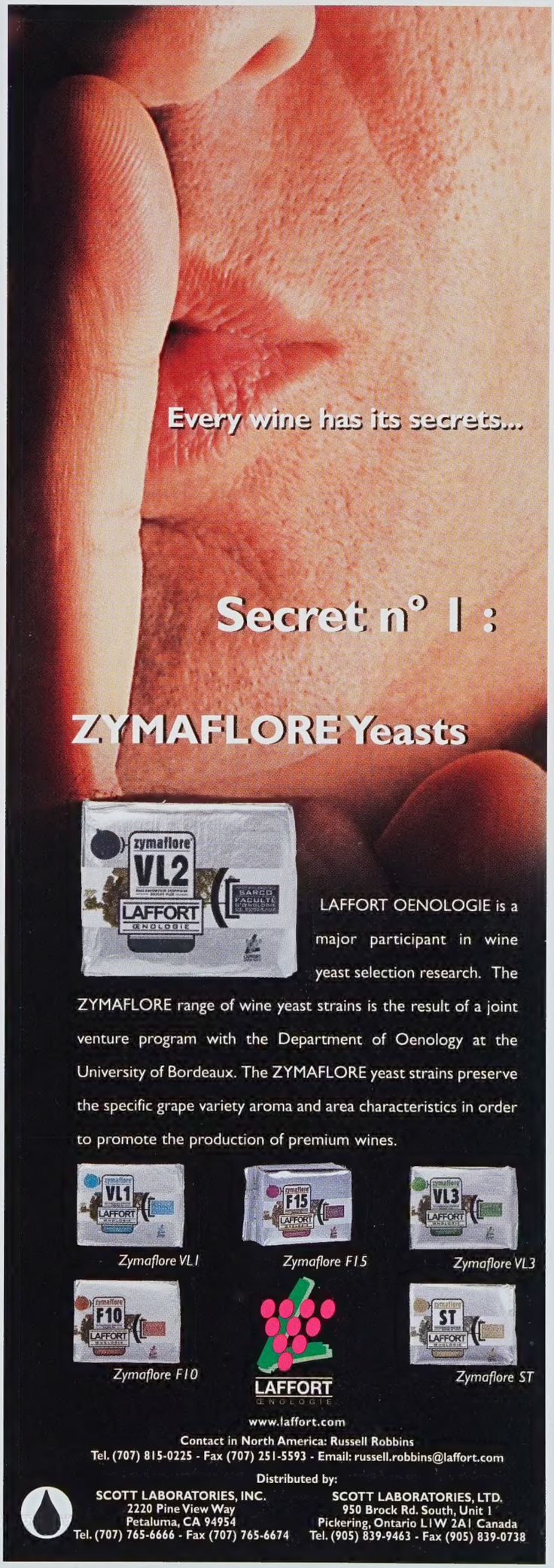
Syrah vines photographed east side of Paso Robles, December 2003. Note symptomatic leaves, often retained late, and also excessive poor lignification of wood which appears white.

Syrah canes, east side of Paso Robles, December 2003, showing poor lignification and pink canes.

1. Similarity of symptoms, including leaf reddening, slowness to ripen, poor fruit coloration, poor wood maturity, delayed bud break, reduced shoot growth and yield, and, in my opinion, vine death.
2. Similarity of spread, apparently by a natural agent, given that the California situation cannot be isolated to certain clones or rootstocks. Why else might symptoms have suddenly appeared for the first time recently?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